

INSTALLATION, OPERATING AND SERVICE INSTRUCTIONS FOR

SERIES 5B GAS-FIRED BOILER



For service or repairs to boiler, call your heating contractor. When seeking information on boiler, provide Boiler Model Number and Serial Number as shown on Rating Label.

Boiler Model Number

K50 _ _ _ _ _

Boiler Serial Number

6 _ _ _ _ _

Installation Date

Heating Contractor

Phone Number

Address



www.burnhamcommercialcastiron.com

8141302R14-3/10

PRICE - \$5.00

SECTION I – EQUIPMENT CHECK LIST

U.S.A. EQUIPMENT CHECK LIST

(For Canadian Equipment Check List, Turn to Pages 4 and 5)

This Equipment Check List has been provided so that the Installer can determine if all parts have been provided for the boiler ordered. It covers standard equipment for both steam and water boilers without Tankless Heaters. Heaters or optional equipment ordered will be in addition to, or in lieu of, equipment shown below.

By opening cartons in numerical sequence, boiler assembly is simplified. If there is an exception, it will be pointed out in the boiler assembly procedure. When it does occur, you will find that assembly of the boiler is further simplified.

BOILER SIZE																			
	5006B	5007B	5008B	5009B	5010B	5011B	5012B	5013B	5014B	5015B	5016B	5017B	5018B	5019B	5020B	5021B	5022B	5024B	5026B
(1) LEH	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
(1) REH	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
(1) C	4	5	6	7	8	8	9	10	11	12	13	14	15	16	16	17	18	19	21
(2) CX	---	---	---	---	---	---	---	---	---	1	1	1	1	1	1	2	2	3	3
(3) CXP	---	---	---	---	---	1	1	1	1	---	---	---	---	---	1	---	---	---	---
(1)	Section Marking Cast on Section																		
(2)	"C" Cast on Section - When supply and return connections are tapped, section is paint stencilled "CX"																		
(3)	"C" Cast on Section - When supply and return connections are tapped and plugged, section is paint stencilled "CXP"																		
CARTONS, PACKAGES, OR BUNDLES																			
1	Base-Burner-Manifold Assembly (By Gas and By Pilot System) - One Left & One Right Req'd on 5015B and Larger Boilers																		
COMPLETE	1 6	1 7	1 8	1 9	1 10	1 11	1 12	1 13	1 14	---	---	---	---	---	---	---	---	---	---
L. SUB-BASE	---	---	---	---	---	---	---	---	---	L 1S 15	L 1S 16	L 1S 17	L 1S 18	L 1S 19	L 1S 20	L 1S 21	L 1S 22	L 1S 24	L 1S 26
R. SUB-BASE	---	---	---	---	---	---	---	---	---	R 1S 8	R 1S 9	R 1S 9	R 1S 10	R 1S 10	R 1S 10	R 1S 10	R 1S 10	R 1S 13	R 1S 13
2	Tie Rod Bundle(s) 4 Sizes - One to Five Per Boiler																		
22"	---	---	1	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
27"	---	---	1	2	1	---	---	---	2	1	---	---	---	---	1	---	---	---	2
37"	1	---	---	---	1	2	1	---	1	2	3	2	1	---	3	4	3	1	---
42"	---	1	---	---	---	---	1	2	---	---	--	1	2	3	---	---	1	3	3
2 A	Draw-up Rod Bundle(s) 3 Sizes - One to Three Per Boiler																		
37¼"	---	---	---	---	---	2	2	1	1	---	---	---	---	---	---	---	---	---	---
49¼"	1	1	---	---	---	---	---	1	1	2	2	1	1	1	---	---	---	3	2
67¼"	---	---	1	1	1	---	---	---	---	---	---	1	1	1	2	2	2	---	1
3 A	Boiler Assembly Carton(s) 6 Sizes - One to Five Per Boiler																		
3A6	1	---	---	---	---	1	---	---	---	---	1	---	---	---	---	1	---	---	---
3A7	---	1	---	---	---	---	1	---	---	---	---	1	---	---	---	---	1	---	---
3A8	---	---	1	---	---	---	---	1	---	---	---	---	1	---	---	---	---	---	1
3A9	---	---	---	1	---	---	---	---	1	---	---	---	---	1	---	---	---	1	1
3A10	---	---	---	---	1	---	---	---	---	1	---	---	---	---	1	---	---	---	---
3AM	---	---	---	---	---	1	1	1	1	1	2	2	2	2	2	3	3	3	3
4	Boiler Sealing Carton(s) 5 Sizes - One to Three Per Boiler																		
06	1	---	---	---	---	2	1	---	---	---	---	---	---	---	2	---	1	---	---
07	---	1	---	---	---	---	1	2	1	---	---	---	---	---	---	2	---	---	---
08	---	---	1	---	---	---	---	---	1	2	1	---	---	---	---	---	---	1	---
09	---	---	---	1	---	---	---	---	---	---	1	2	1	---	---	---	2	2	2
10	---	---	---	---	1	---	---	---	---	---	---	---	1	2	1	1	---	---	1
5	Integral Drafthood Carton(s) 5 Sizes - One to Four Per Boiler (Natural & LP)																		
06	1	---	---	---	---	2	1	---	---	---	---	---	---	---	2	1	---	1	---
07	---	1	---	---	---	---	1	2	1	---	---	---	---	---	---	1	2	3	3
08	---	---	1	---	---	---	---	---	1	2	1	---	---	---	---	---	---	---	1
09	---	---	---	1	---	---	---	---	---	---	1	2	1	---	---	---	---	---	---
10	---	---	---	---	1	---	---	---	---	---	---	---	1	2	1	1	1	---	---

U.S.A. EQUIPMENT CHECK LIST

BOILER SIZE																			
	5006B	5007B	5008B	5009B	5010B	5011B	5012B	5013B	5014B	5015B	5016B	5017B	5018B	5019B	5020B	5021B	5022B	5024B	5026B
CARTONS, PACKAGES OR BUNDLES																			
7 S	Steam Trim Carton (Steam Boilers Only - Includes PA404 Pressure Limit Control) 4 Sizes - One Per Boiler																		
1	1	1	1	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
2	---	---	---	1	1	1	---	---	---	---	---	---	---	---	---	---	---	---	---
3	---	---	---	---	---	---	1	1	1	1	1	1	1	1	1	---	---	---	---
4	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	1	1	1	1
67 BC-2	Low Water Cut-off Carton (Steam Boilers Only) One Per Boiler																		
	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
7 W	Water Trim Carton (Water Boilers Only - Includes L4006A Temp. Limit Control) 3 Sizes - One Per Boiler																		
2	1	1	1	1	1	1	---	---	---	---	---	---	---	---	---	---	---	---	---
3	---	---	---	---	---	---	1	1	1	1	1	1	1	1	1	1	1	---	---
4	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	1	1
64	Low Water Cut-off Carton (Water Boilers Only) One Per Boiler																		
	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
U 8	Complete Jacket Carton Assembly - One Per Boiler																		
9	Gas Train Cartons (By Gas) 2 Sizes - One or Two Per Boiler																		
⁹ ₁	1*	1*	1*	---	---	---	---	---	---	2	1	---	---	---	---	---	---	---	---
⁹ ₂	---	---	---	1*	1	1	1	1	1	---	1	2	2	2	2	2	2	2	2
⁹ _{3 EI}	1	1	1	1	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
EI	Controls Carton(s) (By Gas) (Intermittent Elec. Ign. - 100% Shutoff - 24V.) 1 Size - One or Two Per Boiler																		
^{EI} ₁	1	1	1	1	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
^{EI} ₂	---	---	---	---	1	1	1	1	1	2	2	2	2	2	2	2	2	2	2
U HCP 1	Plain Heater Cover Plate (Not furnished on Water Boiler Ordered With Two Tankless Heaters) One Per Boiler																		
	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
U HCP 2	Tapped (¾" NPT) Heater Cover Plate (Not Furnished on Water Boiler Ordered With Tankless Heater(s) One Per Boiler																		
	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1

INSPECT SHIPMENT carefully for any signs of damage. All equipment is carefully manufactured, inspected and packed. Our responsibility ceases upon delivery of Boiler to carrier in good condition. Any claims for damage or shortage in shipment must be filed immediately against the carrier by the consignee. No claims for variances or shortages will be allowed by Boiler Manufacturer, unless presented within sixty (60) days after receipt of equipment.

*Carton ⁹₁, or ⁹₂ on sizes 5006B thru 5009B is standard on all systems except EI and may be optional on 5006B thru 5009B EI.

Carton ⁹₃ is standard on sizes 5006B thru 5009B for EI systems.

IMPORTANT INFORMATION

SERVICE ON THIS BOILER SHOULD BE UNDERTAKEN ONLY BY TRAINED AND SKILLED PERSONNEL.

KEEP BOILER AREA CLEAR AND FREE FROM COMBUSTIBLE MATERIALS, GASOLINE AND OTHER FLAMMABLE VAPORS AND LIQUIDS.

DO NOT PLACE ANY OBSTRUCTION IN THE BOILER ROOM THAT WILL HINDER THE FLOW OF COMBUSTION AND VENTILATING AIR.

READ THESE INSTRUCTIONS CAREFULLY BEFORE PROCEEDING WITH THE INSTALLATION OF BOILER. POST INSTRUCTIONS NEAR BOILER FOR REFERENCE BY OWNER AND SERVICEMAN.

MAINTAIN INSTRUCTIONS IN LEGIBLE CONDITION.

CANADIAN EQUIPMENT CHECK LIST

This Equipment Check List has been provided so that the Installer can determine if all parts have been provided for the boiler ordered. It covers standard equipment for both steam and water boilers without Tankless Heaters. Heaters or optional equipment ordered will be in addition to, or in lieu of, equipment shown below.

By opening cartons in numerical sequence, boiler assembly is simplified. If there is an exception, it will be pointed out in the boiler assembly procedure. When it does occur, you will find that assembly of the boiler is further simplified.

BOILER SIZE																			
	5006B	5007B	5008B	5009B	5010B	5011B	5012B	5013B	5014B	5015B	5016B	5017B	5018B	5019B	5020B	5021B	5022B	5024B	5026B
(1) LEH	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
(1) REH	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
(1) C	4	5	6	7	8	8	9	10	11	12	13	14	15	16	16	17	18	19	21
(2) CX	---	---	---	---	---	---	---	---	---	1	1	1	1	1	1	2	2	3	3
(3) CXP	---	---	---	---	---	1	1	1	1	---	---	---	---	---	1	---	---	---	---
(1)	Section Marking Cast on Section																		
(2)	"C" Cast on Section - When supply and return connections are tapped, section is paint stencilled "CX"																		
(3)	"C" Cast on Section - When supply and return connections are tapped and plugged, section is paint stencilled "CXP"																		
CARTONS, PACKAGES, OR BUNDLES																			
1	Base-Burner-Manifold Assembly (By Gas and By Pilot System) - One Left & One Right Req'd on 5015B and Larger Boilers																		
COMPLETE	1 6	1 7	1 8	1 9	1 10	1 11	1 12	1 13	1 14	---	---	---	---	---	---	---	---	---	---
L. SUB-BASE	---	---	---	---	---	---	---	---	---	L 1S 15	L 1S 16	L 1S 17	L 1S 18	L 1S 19	L 1S 20	L 1S 21	L 1S 22	L 1S 24	L 1S 26
R. SUB-BASE	---	---	---	---	---	---	---	---	---	R 1S 8	R 1S 9	R 1S 9	R 1S 10	R 1S 10	R 1S 10	R 1S 10	R 1S 10	R 1S 13	R 1S 13
2	Tie Rod Bundle(s) 4 Sizes - One to Five Per Boiler																		
22"	---	---	1	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
27"	---	---	1	2	1	---	---	---	2	1	---	---	---	---	1	---	---	---	2
37"	1	---	---	---	1	2	1	---	1	2	3	2	1	---	3	4	3	1	---
42"	---	1	---	---	---	---	1	2	---	---	---	1	2	3	---	---	1	3	3
2 A	Draw-up Rod Bundle(s) 3 Sizes - One to Three Per Boiler																		
37¾"	---	---	---	---	---	2	2	1	1	---	---	---	---	---	---	---	---	---	---
49¾"	1	1	---	---	---	---	---	1	1	2	2	1	1	1	---	---	---	3	2
67¼"	---	---	1	1	1	---	---	---	---	---	---	1	1	1	2	2	2	---	1
3 A	Boiler Assembly Carton(s) 6 Sizes - One to Five Per Boiler																		
3A6	1	---	---	---	---	1	---	---	---	---	1	---	---	---	---	1	---	---	---
3A7	---	1	---	---	---	---	1	---	---	---	---	1	---	---	---	---	1	---	---
3A8	---	---	1	---	---	---	---	1	---	---	---	---	1	---	---	---	---	---	1
3A9	---	---	---	1	---	---	---	---	1	---	---	---	---	1	---	---	---	1	1
3A10	---	---	---	---	1	---	---	---	---	1	---	---	---	---	1	---	---	---	---
3AM	---	---	---	---	---	1	1	1	1	1	2	2	2	2	2	3	3	3	3
4	Boiler Sealing Carton(s) 5 Sizes - One to Three Per Boiler																		
06	1	---	---	---	---	2	1	---	---	---	---	---	---	---	2	---	1	---	---
07	---	1	---	---	---	---	1	2	1	---	---	---	---	---	---	2	---	---	---
08	---	---	1	---	---	---	---	---	1	2	1	---	---	---	---	---	---	1	2
09	---	---	---	1	---	---	---	---	---	---	1	2	1	---	---	---	2	2	1
10	---	---	---	---	1	---	---	---	---	---	---	---	1	2	1	1	---	---	---
5	Integral Drafthood Carton(s) 5 Sizes - One to Four Per Boiler																		
06	1	---	---	---	---	2	1	---	---	---	---	---	---	---	2	1	---	1	---
07	---	1	---	---	---	---	1	2	1	---	---	---	---	---	---	1	2	3	3
08	---	---	1	---	---	---	---	---	1	2	1	---	---	---	---	---	---	---	---
09	---	---	---	1	---	---	---	---	---	---	1	2	1	---	---	---	---	---	---
10	---	---	---	---	1	---	---	---	---	---	---	---	1	2	1	1	1	---	---

CANADIAN EQUIPMENT CHECK LIST

BOILER SIZE																			
	5006B	5007B	5008B	5009B	5010B	5011B	5012B	5013B	5014B	5015B	5016B	5017B	5018B	5019B	5020B	5021B	5022B	5024B	5026B
CARTONS, PACKAGES OR BUNDLES																			
7 S Steam Trim Carton (Steam Boilers Only - Includes PA404 Pressure Limit Control) 4 Sizes - One Per Boiler																			
1	1	1	1	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
2	---	---	---	1	1	1	---	---	---	---	---	---	---	---	---	---	---	---	---
3	---	---	---	---	---	---	1	1	1	1	1	1	1	1	1	---	---	---	---
4	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	1	1	1	1
67 BC-2 Low Water Cut-off Carton (Steam Boilers Only) One Per Boiler																			
	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
7 W Water Trim Carton (Water Boilers Only - Includes L4006A Temp. Limit Control) 3 Sizes - One Per Boiler																			
2	1	1	1	1	1	1	---	---	---	---	---	---	---	---	---	---	---	---	---
3	---	---	---	---	---	---	1	1	1	1	1	1	1	1	1	1	1	1	1
4	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	1
64 Low Water Cut-off Carton (Water Boilers Only) One Per Boiler																			
	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
U Complete Jacket Carton Assembly - One Per Boiler																			
8																			
c		Gas Train Cartons (By Gas) 2 Sizes - One or Two Per Boiler																	
9																			
1																			
c		1	1	1	---	---	---	---	---	2	1	---	---	---	---	---	---	---	---
9		---	---	---	1	1	1	1	1	---	1	2	2	2	2	2	2	2	2
1																			
THERM. Controls Carton(s) (Manual Ignition. - 100% Shutoff - 24V.) 1 Size - One or Two Per Boiler																			
Natural	1	1	1	1	1	1	1	1	1	---	2	2	2	2	2	2	2	2	---
EO Controls Carton(s) (By Gas) (Manual Ign. - 100% Shutoff - 24V. - Nat. - 120V. LP) 1 Size - One or Two Per Boiler																			
Natural	---	---	---	---	---	---	---	---	1	---	---	---	---	---	---	---	---	---	2
Propane	1	1	1	1	1	1	1	1	1	2	2	2	2	2	2	2	2	2	2
U Plain Heater Cover Plate (Not furnished on Water Boiler Ordered With Two Tankless Heaters) One Per Boiler																			
HCP																			
1		1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
U		Tapped (¾" NPT) Heater Cover Plate (Not Furnished on Water Boiler Ordered With Tankless Heater(s) One Per Boiler																	
HCP																			
2																			
		1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1

INSPECT SHIPMENT carefully for any signs of damage. All equipment is carefully manufactured, inspected and packed. Our responsibility ceases upon delivery of Boiler to carrier in good condition. Any claims for damage or shortage in shipment must be filed immediately against the carrier by the consignee. No claims for variances or shortages will be allowed by Boiler Manufacturer, unless presented within sixty (60) days after receipt of equipment.

This Series 5B Boiler has been approved by the Massachusetts Board of Plumbers and Gas Fitters:

Approval No. G1-0202-11A.

The Commonwealth of Massachusetts requires this product to be installed by a licensed Plumber or Gas Fitter.

SECTION I - EQUIPMENT CHECK LIST - Page 2

SECTION II - GENERAL INFORMATION - Page 7

SECTION III - INSTALLATION INSTRUCTIONS - Page 8

SECTION IV - OPERATION - Page 43

SECTION V - SERVICE - Page 75

SECTION VI - REPAIR PARTS - Page 82

NOTE

- 5006B THRU 5014B BOILERS REQUIRE SINGLE GAS TRAIN LOCATION ON LEFT END OF BOILER (STANDARD) GAS TRAIN MAY BE RELOCATED TO RIGHT END OF BOILER (EXCEPT 5012B AND 5014B BOILERS).
- 5015B THRU 5026B BOILERS REQUIRE DUAL GAS TRAINS.
- GAS SUPPLY PRESSURE, IN W.C.
NATURAL GAS
MAXIMUM: 14" W.C.
MINIMUM: 5.5" W.C.
(5009B AND 5011B THRU 5014B AND 5020B THRU 5026B)
MINIMUM: 5" W.C.
(5006B THRU 5008B AND 5010B, 5015B THRU 5019B)
LP GAS:
MAXIMUM: 14" W.C.
MINIMUM: 11" W.C.
(5009B AND 5011B THRU 5014B AND 5020B THRU 5026B)
MINIMUM: 5" W.C.
(5006B THRU 5008B AND 5010B, 5015B THRU 5019B)
- WATER BOILERS - MAXIMUM DESIGN WORKING PRESSURE: 50 PSI.
- STEAM BOILER - MAXIMUM DESIGN WORKING PRESSURE: 15 PSI.
- DIMENSIONS IN INCHES

Boiler Size	Jacket Overall Length 'A'	Drafthood Height, Size and Location										Top Supply and Rear Return Location				Supply Conn. Qty & Size	Return Conn. Qty. & Size	Gas Conn. Size Nat. & Propane	No. & Dia. of Flue Outlets	Approx. Shipping Weight (LB.)
		'B' Dia.	'C' Dia.	'D' Dia.	'E' Dia.	'F'	'G'	'H'	'J'	'K'	'M'	'N'								
5006B	34	9	---	---	---	---	---	---	17	19-3/4	---	---	(2) 3	(2) 3	1	(1) 9	1160			
5007B	39-3/8	10	---	---	---	---	---	---	19-3/4	32-1/4	---	---	(2) 3	(2) 3	1	(1) 10	1340			
5008B	44-3/4	12	---	---	---	---	---	---	22-3/8	38-3/8	---	---	(2) 3	(2) 3	1	(1) 12	1525			
5009B	50-1/4	12	---	---	---	---	---	---	25-1/8	43-3/4	---	---	(2) 3	(2) 3	1-1/4*	(1) 12	1720			
5010B	55-3/4	12	---	---	---	---	---	---	27-7/8	49-1/4	---	---	(2) 3	(2) 3	1-1/4	(1) 12	1895			
5011B	61-1/8	9	9	---	---	27-1/4	---	---	17	54-3/4	---	---	(2) 3	(2) 3	1-1/4	(2) 9	2085			
5012B	66-1/2	9	10	---	---	29-7/8	---	---	19-3/4	60-1/8	---	---	(2) 3	(2) 3	1-1/4	(1) 9, (1) 10	2280			
5013B	72	10	10	---	---	32-5/8	---	---	19-3/4	65-1/2	---	---	(2) 3	(2) 3	1-1/4	(2) 10	2460			
5014B	77-1/2	10	12	---	---	35-3/8	---	---	22-3/8	71	---	---	(2) 3	(2) 3	1-1/4	(1) 10, (1) 12	2640			
5015B	82-7/8	12	12	---	---	38	---	---	22-3/8	38-1/4	38-1/4	---	(3) 3	(2) 3, (1) 2-1/2	(2) 1*	(2) 12	2870			
5016B	88-1/4	12	12	---	---	40-3/4	---	---	25-1/8	38-1/4	43-5/8	---	(3) 3	(2) 3, (1) 2-1/2	(1) 1, (1) 1-1/4*	(2) 12	3070			
5017B	93-3/4	12	12	---	---	43-1/2	---	---	25-1/8	43-5/8	43-5/8	---	(3) 3	(2) 3, (1) 2-1/2	(2) 1-1/4*	(2) 12	3265			
5018B	99-1/4	12	12	---	---	46-1/4	---	---	27-7/8	43-5/8	49-1/8	---	(3) 3	(2) 3, (1) 2-1/2	(2) 1-1/4*	(2) 12	3445			
5019B	104-5/8	12	12	---	---	49	---	---	27-7/8	49-1/8	49-1/8	---	(3) 3	(2) 3, (1) 2-1/2	(2) 1-1/4*	(2) 12	3620			
5020B	110	9	9	12	---	27-1/4	38	---	27-7/8	54-1/2	49-1/8	---	(3) 3	(2) 3, (1) 2-1/2	(2) 1-1/4*	(2) 9, (1) 12	3810			
5021B	115-1/2	9	10	12	---	29-7/8	40-3/4	---	27-7/8	27-3/8	32-5/8	49-1/8	(4) 3	(2) 3, (2) 2-1/2	(2) 1-1/4*	(1) 9, (1) 10, (1) 12	4005			
5022B	121	10	10	12	---	32-5/8	40-3/4	---	27-7/8	32-3/4	32-5/8	49-1/8	(4) 3	(2) 3, (2) 2-1/2	(2) 1-1/4*	(2) 10, (1) 12	4185			
5024B	131-3/4	9	10	10	10	29-7/8	32-5/8	32-5/8	19-3/4	27-3/8	65-1/4	32-3/4	(5) 3	(2) 3, (2) 2-1/2	(2) 1-1/4*	(1) 9, (3) 10	4530			
5026B	142-3/4	10	12	10	10	35-3/8	35-3/8	32-5/8	19-3/4	32-3/4	70-3/4	32-3/4	(5) 3	(2) 3, (2) 2-1/2	(2) 1-1/4*	(3) 10, (1) 12	4895			

* Dual Manifolds - 5015B thru 5026B

**1" - USA - EI

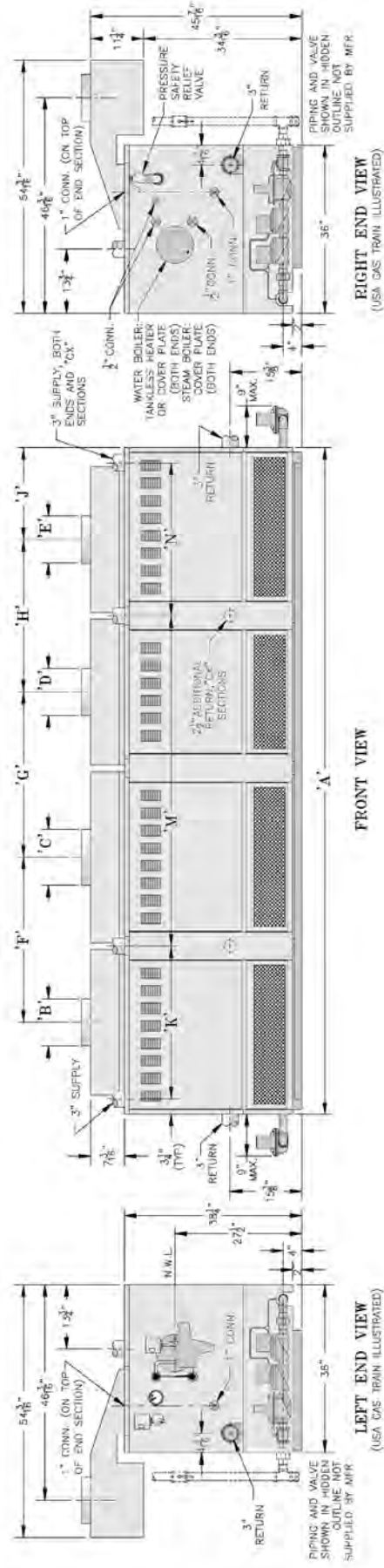


FIG. 1
DIMENSIONAL DATA

SECTION II – GENERAL INFORMATION

1. BOILER INSTALLATION must conform to the requirements of the authority having jurisdiction, or in the absence of such requirements, to:

USA – “National Fuel Gas Code, ANSI Z223.1”.

When required by the authority having jurisdiction, the installation must conform to American Society of Mechanical Engineers Safety Code for Controls and Safety Devices for Automatically Fired Boilers, No. CSD-1.

CANADA – “Installation Codes for Natural and Propane Gas Burning Appliances and Equipment, CAN/CSA-B149 (.1 or .2)”.

DO NOT INSTALL THIS BOILER ON CARPETING.

2. BOILER LOCATION – locate on a level NON-COMBUSTIBLE FLOOR as close as possible to chimney so that vent connection is short and direct.

DANGER

Boiler must not be installed directly on combustible flooring. A concrete pad is not sufficient to protect combustible flooring.

The boiler shall be installed such that the gas ignition system components are protected from water (dripping, spraying, rain, etc.) during boiler operation and service (circulator replacement, control replacement, etc.).

Do not install boiler where gasoline or other flammable vapors or liquids, or sources of hydrocarbons (i.e. bleachers, cleaners, chemicals, sprays, paint removers, fabric softeners, etc.) are used or stored.

Refer to table below for minimum clearances, service clearances, and clearances for removal of Tankless Heaters.

3. PROVIDE COMBUSTION AND VENTILATION AIR.

In the USA refer to *National Fuel Gas Code*, NFPA 54/ANSI Z223. Section 5.3, Air for Combustion and Ventilation. In Canada refer to *Natural Gas Installation Code*, CAN/CSA-B149.1 – latest edition or *Propane Installation Code*, CAN/CSA-B149.2 – latest edition. Local code provisions may apply and should be referenced.

WARNING

Adequate combustion and ventilation air must be provided to assure proper combustion.

- a. Determine volume of space (boiler room). Rooms communicating directly with the space, in which the appliances are installed, through openings not furnished with doors, are considered a part of the space.

$$\text{Volume (ft}^3\text{)} = \text{Length (ft)} \times \text{Width (ft)} \times \text{Height (ft)}$$

- b. Determine total input of all appliances in the space. Add inputs of all appliances in the space and round the result to the nearest 1000 Btu per hour.
- c. Determine type of space.

Divide Volume by Total Input of all appliances in space. If the result is greater than or equal to 50 ft³/1000 Btu per hour, then it is considered an *unconfined space*.

If the result is less than 50 ft³/1000 Btu per hour, then the space is considered a *confined space*.

- d. For boiler located in an *unconfined space of a conventionally constructed building*, the fresh air infiltration through cracks around windows and doors normally provides adequate air for combustion and ventilation.
- e. For boiler located in a confined space or an unconfined space in a building of unusually tight construction, provide outdoor air with the use of two permanent openings which communicate directly or by duct with the outdoors or spaces (crawl or attic) freely communicating with the outdoors. Locate one opening within 12 inches of top of space. Locate remaining opening within 12 inches of bottom of space. Minimum dimension of air opening is 3 inches. Size each opening per following:
 1. Direct communication with outdoors. Minimum free area of 1 square inch per 4,000 Btu per hour input of all equipment in space.
 2. Vertical ducts. Minimum free area of 1 square inch per 4,000 Btu per hour input of all

CLEARANCES - From Table below and from dimensional data in Fig. 1, determine BOILER ROOM space necessary for appropriate access to and servicing of Boiler. Consideration should be given to other appliances installed in the same area. Consult with local Building and Safety Codes for compliance.

	MINIMUM CLEARANCE - JACKET TO COMBUSTIBLE CONSTRUCTION	U.S.A. SERVICE CLEARANCE TO NON-COMBUSTIBLE CONSTRUCTION	CLEARANCES REQ'D FOR REMOVAL OF TANKLESS HEATER		
			AT-2	AT-3	AT-4
Left Side	24" (61 cm)	18" (Controls) *	27"	32"	42"
Right Side	24" (61 cm)	18" (Controls) *	27"	32"	42"
Front	24" (61 cm)	36" (Cleaning-Burner Removal) *	---	---	---
Rear	24" (61 cm)	36" (Cleaning) *	---	---	---
Top	24" (61 cm)	-----	---	---	---

* CANADA: 48" (122 cm) Clearance is required

equipment in space. Duct cross-sectional area shall be same as opening free area.

3. Horizontal ducts. Minimum free area of 1 square inch per 2,000 Btu per hour input of all equipment in space. Duct cross-sectional area shall be same as opening free area.

Alternate method for boiler located within confined space. Use indoor air if two permanent openings communicate directly with additional space(s) of sufficient volume such that combined volume of all spaces meet criteria for unconfined space. Size each opening for minimum free area of 1 square inch per 1,000 Btu per hour input of all equipment in spaces, but not less than 100 square inches.

4. LOUVERS AND GRILLES of Ventilation Ducts

All outside openings should be screened and louvered. Screens used should not be smaller than ¼ inch mesh. Louvers will prevent the entrance of rain and snow.

- a. Free area requirements need to consider the blocking effect of louvers, grilles, or screens protecting the openings. If the free area of the louver or grille is not known, assume wood louvers have 20-25 percent free area and metal louvers and grilles have 60-75 percent free area.
- b. Louvers and grilles must be fixed in the open position or interlocked with the equipment to open automatically during equipment operation.

SECTION III – INSTALLATION INSTRUCTIONS

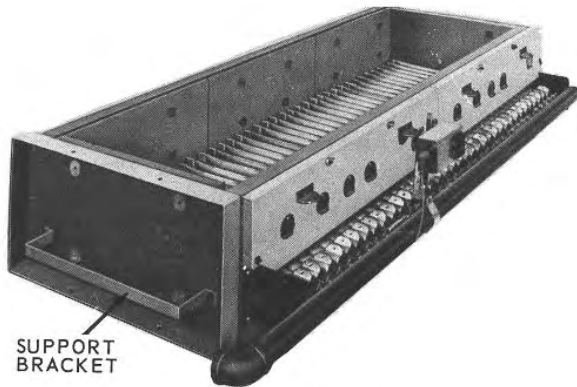


FIG. 2
SINGLE MANIFOLD BASE 5006B
THRU 5014B SECTION BOILERS

1. BASE-BURNER-MANIFOLD ASSEMBLY(S).

- a. 6 section thru 14 section boilers require single base assembly, see Fig. 2.
- b. 15 section thru 26 section boilers require a left and a right base subassembly, see Fig. 3.

Remove Base Assembly(s) From Skid(s)

- c. Remove bolts securing Base Assembly(s) to shipping skid(s) and place Base(s) in location where Boiler is to be installed.
- d. Join Base Sub-assemblies together (15 section & larger boilers) by first removing upper shipping strip and lower shipping angles from subassemblies. Use (4) ¼"-20 x ¾" MS, nuts and washers to attach subassemblies, see Fig. 3.
- e. Attach Front Intermediate Jacket Panel Support Bracket and Lower Rear Intermediate Panel Support Bracket to lower channel on Front Base Frame and Rear Base Frame, respectively, using (4) ¼"-20 x ¾" MS, nuts and washers.

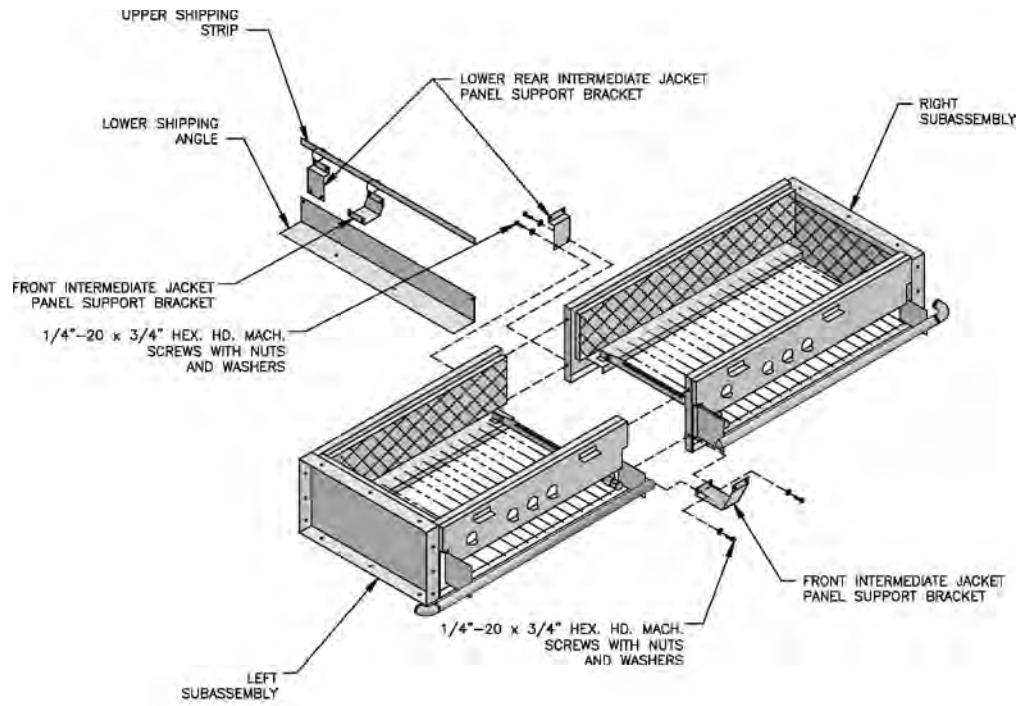
- f. Base must be level in both directions and secure on the floor. Shim and grout under Base if necessary.
- g. Place cardboard covering over the top of the burner assembly to protect them during the assembly of the boiler sections.

2. CLEAN BOILER SECTIONS inside and out to remove dirt due to shipment and handling.

Open Tie Rod Bundle(s). Open Draw-up Rod Bundle(s).

Open Boiler Assembly Carton(s).

3. SET LEFT END SECTION ON BASE so that locating lugs on bottom of section go inside Front and Rear Base Frames. Slide section on base until these lugs strike High Base End Panel at left end of Base, see Fig. 4. (Note – if High Base End Panel is at right end of Base, section assembly must start with Right End Section). Left end sections are identified by "LEH" cast on section; Right End Sections are identified by "REH" cast on section.
4. CLEAN NIPPLES AND NIPPLE PORTS thoroughly with a de-greasing solvent. Use the Loctite® #592 supplied to lubricate the nipples and nipple ports. Apply the lubricant to the nipples and nipple ports, then use a brush to disperse it evenly around the nipples and the nipple ports. Use approximately 25 ml of Loctite® #592 per flueway [(1) 7" and (2) 3" nipples and their (6) corresponding nipple ports]. Use Nipple Gauge furnished – follow instructions included with gauge to set nipples. USE ALL PRECAUTIONS TO AVOID COCKED NIPPLES.
5. PAINT ALL GROUND SURFACES of each section with the Sealer Compound furnished.
6. ASSEMBLE CENTER SECTIONS. Refer to Fig. 6 for proper location of Tapped, and sometimes plugged, Center Sections on 11 section and larger boilers. THIS IS IMPORTANT.



1. REMOVE LOWER SHIPPING ANGLE AND UPPER SHIPPING STRIP FROM BOTH BASE SUBASSEMBLIES.
2. BOLT SUBASSEMBLIES TOGETHER.
3. ATTACH FRONT INTERMEDIATE JACKET PANEL SUPPORT BRACKET TO FRONT BASE FRAMES.
4. ATTACH LOWER REAR INTERMEDIATE JACKET PANEL SUPPORT BRACKET TO REAR BASE FRAMES.

FIG. 3

DUAL MANIFOLD BASES - 5015B THRU 5026B SECTION BOILERS

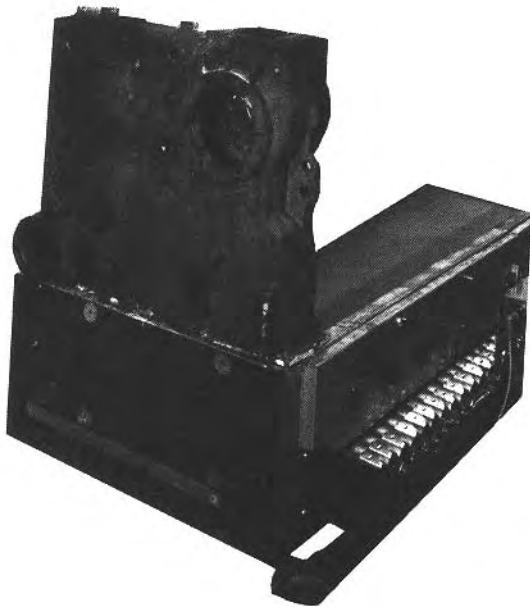


FIG. 4
LEH SECTION ON BASE

- a. Carefully join a Center Section with nipples in adjoining section and bump lightly to secure.
- b. Run nut approximately 8" on two (2) $\frac{3}{4}$ " draw-up rods of equal length. (Note – more than one set of draw-up rods are furnished on 8 section and larger boilers). Place draw-up channel and one flat washer against nut.
- c. Insert short end of draw-up rod through front & rear nipple ports on both sections, see Fig. 5.
- d. Place two (2) flat washers, draw-up channel and a nut on each end of draw-up rods and finger tighten.

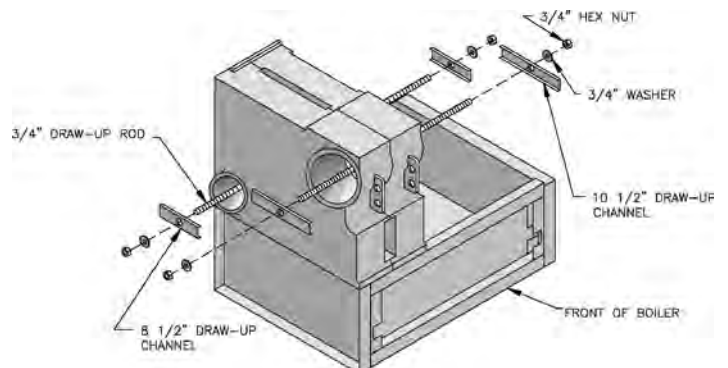
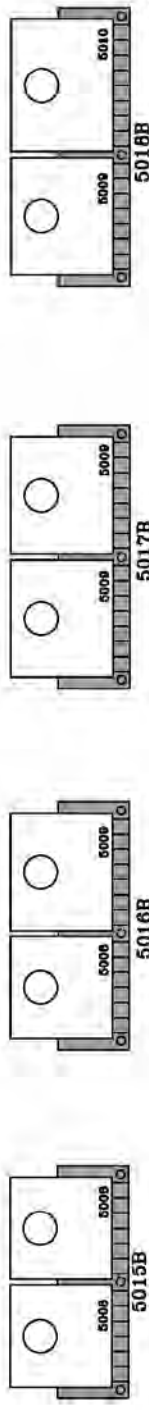
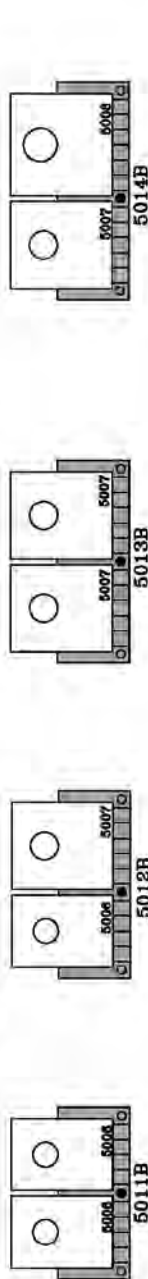
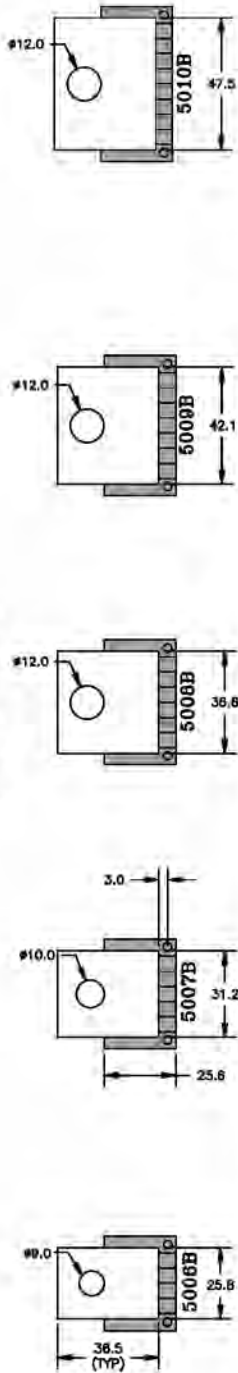
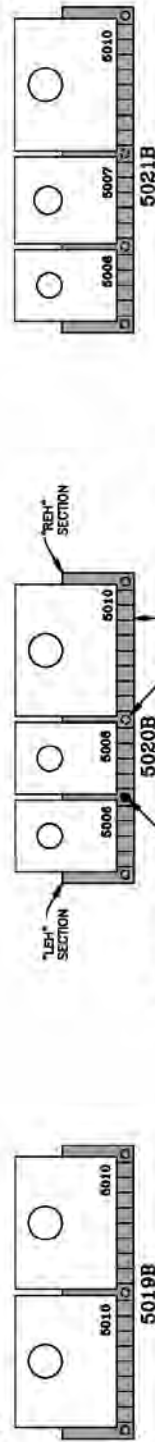
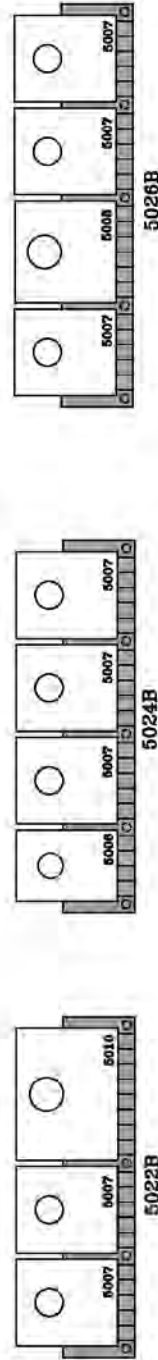


FIG. 5
ASSEMBLY OF CENTER SECTIONS

REAR OF BOILERS**LEFT SIDE OF BOILERS****RIGHT SIDE OF BOILERS**

"LH" SECTION
"RH" SECTION
"C" CENTER SECTION - PLAN (NOT TAPPED)
"C" CENTER SECTION (TAPPED & PLUGGED)
"C" CENTER SECTION (TAPPED - NOT PLUGGED)

**FRONT OF BOILERS**

- SUPPLY & RETURN ON RIGHT & LEFT END SECTIONS NOT PLUGGED.
- SUPPLY & RETURN ON CENTER SECTION NOT PLUGGED.
- SUPPLY & RETURN ON CENTER SECTION PLUGGED.

1. THE NUMBERS ON THE CANOPIES INDICATE CANOPY SIZE.

FIG. 6
ARRANGEMENT OF SECTIONS AND CANOPY(S)

- e. **DRAW UP CENTER SECTION SLOWLY AND EVENLY**, tightening each **DRAW-UP ROD** a little at a time so that sections are equally spaced. **KEEP NIPPLES ALIGNED WITH NIPPLE PORTS**. If necessary, tap Nipples lightly with a blunt tool or rod to keep Nipples from cocking while Sections are being drawn up. **DO NOT DRAW UP SECTION(S) WHEN NIPPLES ARE COCKED**. Continue tightening Draw-Up Rods equally until Sections meet iron-to-iron on the ground surface. **BUMPING OUTER EDGES OF SECTION WITH WOODEN BLOCK WILL EASE DRAW-UP OPERATION**.
- f. **KEEP DRAW-UP ROD THREADS, NUTS AND WASHERS LUBRICATED** with grease or heavy oil to prevent damage to rods and threads and to make assembling easier.
- g. **USING A PINCH BAR**, insert **WOOD WEDGES** under last Center Section assembled so as to raise it just above Boiler Base. This will keep the next section to be assembled above the base, thus making

it easier to join and draw-up. **MOVE WOOD WEDGES FORWARD EACH** time a Section has been drawn up.

7. **ASSEMBLE REMAINING END SECTION WITH DRAW-UP RODS** in a manner similar to that for assembling Center Sections. Remove wedges from under Boiler. Be sure Boiler is aligned and seated on Base.

- a. After section assembly is completed install 5/8" tie rods from tie rod bundle through the upper lug holes in the front of Boiler and Lower lug holes in the rear of Boiler sections and tighten until they are finger tight only, to allow for expansion. This is necessary in order to allow clearance for installation of Flue cover plates. Finally, remove 3/4" draw-up rods from nipple ports.

Open Steam or Water Trim Carton

8. **USE THE PLUGS IN THIS CARTON** to plug tappings in End Sections that will not be utilized on final installation, see Fig. 7.

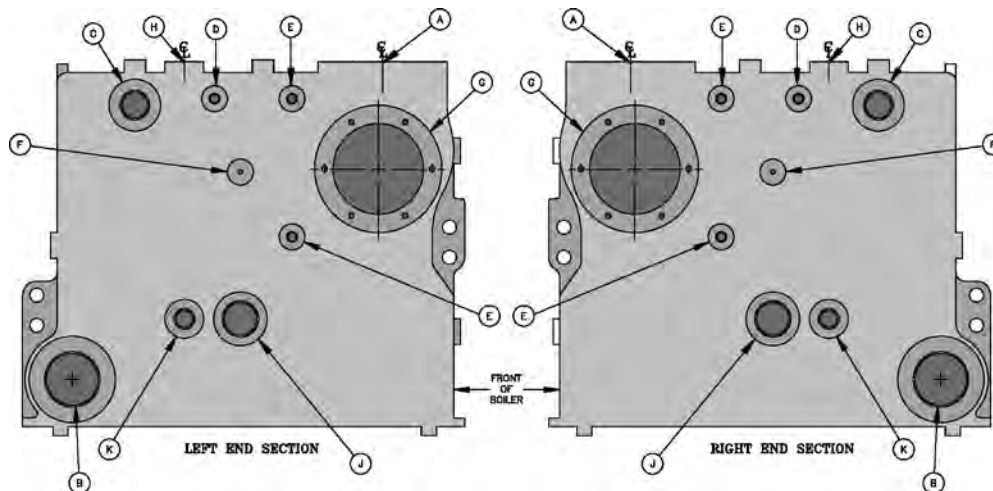


FIG. 7
PURPOSE OF TAPPINGS AND THEIR LOCATIONS

PURPOSE OF TAPPINGS ¹				
Location	Tapping Per End Section	Size	Steam Boilers	Water Boilers
A	1	3"	Supply	Supply
B	1	3"	Return	Return
C ²	1	1-1/2"	Pressure Operating Control (Bushed to 1/4")	Temperature Operating Control (less heater) Bushed to 3/4"; Plug (with heater)
D	1	1/2"	Pressure Gauge	Theraltimeter
E	2	1/2"	Water Gauge, LWCO & Pressure Limit	Plug
F	1	3/8"	Try-Cock (Special Order)	----
G ³	1	----	Cover Plate	Cover Plate or Tankless Heater
H	1	1"	See Note 4	See Note 4
J	1	1-1/2"	Indirect Water Heater Supply or Return	----
K	1	3/4"	Indirect Water Heater Limit	----

¹ Tappings on both end sections are identical - Recommend trim be installed in left end section or on same end as gas train.

² This tapping is used for safety valve and surface blowoff (steam boilers) and safety relief valve (water boilers) on end not equipped with trim.

³ Temperature operating control location on tankless heater equipped boilers. Also alternate operating control location, tapped cover plate.

⁴ If using a float type LWCO, feeder or pump controller on a steam boiler that does not use quick connect hook up fittings, install between tappings H and return B. Use opposite return B for system return connection. Water boilers using a probe LWCO must mount probe in supply pipe above boiler without any stop valves.



FIG. 8

INSTALLATION OF BUILT-IN HEATER

Open Tankless Heater Carton(s) If Supplied.

Open Heater Opening Cover Plate Carton(s).

9. INSTALL BUILT-IN WATER HEATER(S) OR HEATER OPENING COVER PLATE(S), See Fig. 8. Heater may be installed in either End Section or, in some cases, in both End Sections. Heater Opening Cover Plates are used to cover any unused heater openings.
 - a. Place rubber gasket against surface of plate and align holes.
 - b. Place washer on each of 3/8" Cap Screws furnished and insert cap screws through plate and gasket. Start all screws in taps before final tightening.
10. **HYDROSTATIC TEST** - After the boiler sections have been assembled, it is essential that the boiler be hydrostatically tested before the canopy, flue cover plates, jacket, or piping is installed.
 - a. Plug all boiler tappings and fill boiler completely with cold water.

CAUTION

DO NOT install gauge until after hydrostatic testing the boiler. Gauge failure may result.

- b. All completed boilers must satisfactorily pass the prescribed hydrostatic test.
 - (1) **STEAM BOILERS:** The assembled boiler must be subjected to a hydrostatic test of 45 psig to 55 psig.
 - (2) **HOT WATER BOILERS:** The assembled boiler must be subjected to a hydrostatic test of 75 psig to 85 psig.

WARNING

Failure to properly hydrotest all boilers at the correct pressure may result in section assembly failure in operation.

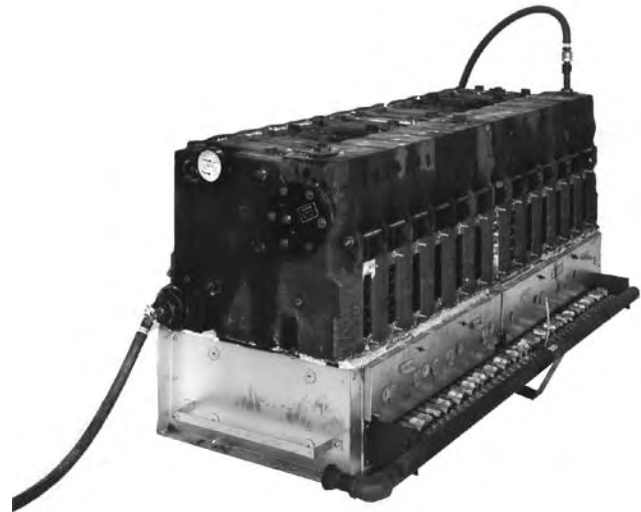


FIG. 9

TESTING BOILER ASSEMBLY FOR LEAKS

11. EXAMINE BOILER CAREFULLY, INSIDE AND OUTSIDE, to insure against leaks from cocked nipples or through concealed breakage caused in shipping and handling. This precaution is for your protection and will simplify handling of necessary replacements and adjustment claims. After making certain that there are no leaks, drain boiler and remove plugs for boiler trim and other connections.

Open Boiler Sealing Carton.

12. SEAL BETWEEN BOILER SECTIONS AND BASE, see Fig. 10.
 - a. Push 3/4" braided ceramic fibre Rope (furnished) into gap between bottom of End Section and Low Base End Panel until rope touches Front and Rear Base Frames. Place the 1-1/2" x 2" x 5/8" steel spacers between low base panel and section and in front of rope – align holes. Secure section to low base end panel with 3/8"-16 x 2" Cap Screws, washers and nuts.
 - b. Secure opposite end section to high base end panel with 3/8"-16 x 2" Cap Screws, washers and nuts.
 - c. Apply Furnace Cement to gaps between section assembly and base to make gas tight seal.
 - d. Check all joints between Boiler sections and use remaining Furnace Cement or Sealer Compound to make joints gas tight.
13. INSTALL FLUE COVER PLATES over cleanout openings on Front and Rear of Boiler. Use 1/4" Carriage Bolts installed at top and bottom of flue openings and secure with washer and jam nut to provide a fixed stud. Install flue cover plates over studs with insulation against Boiler and secure with washers and nuts, see Fig. 11.
14. CONNECT SUPPLY AND RETURN PIPING TO HEATING SYSTEM.

CLEARANCES – Steam and Hot water pipes shall have clearances of at least 1/2" from all combustible construction.

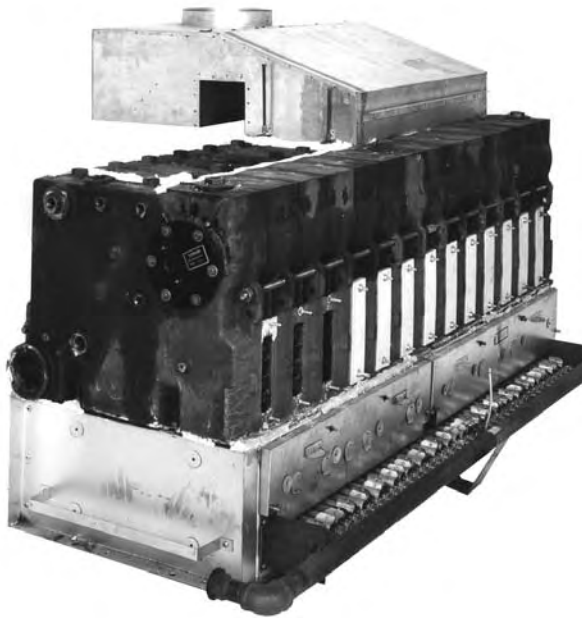


FIG. 10
SEALING OF BASE, INSTALLATION OF
FLUE COVERS AND CANOPIES

- a. With Steam Heating System, refer to Fig. 12, 13A, 13B.

NOTICE

Before using copper for steam piping, consider the following characteristics of copper piping:

- 1) high coefficient of thermal expansion can induce mechanical stresses and cause expansion/contraction noises if not accounted for in the piping system design and installation,**
- 2) high heat transfer rate (heat loss) of uninsulated copper piping must be included in the normal piping and pickup factors used to size the boiler,**
- 3) soldering or brazing pastes and fluxes that end up in the system can cause poor heat transfer, surging, and unsteady water line and wet steam if not thoroughly removed during the boil out procedure and,**
- 4) galvanic corrosion of the adjoining metal may occur due to dissimilar metals in certain water chemistries if dielectric unions are not used.**

- b. With Forced Circulation HOT WATER HEATING SYSTEMS, see Fig. 14A and 14B. For additional reference, consult I=B=R Installation and Piping Guide No. 250.

NOTE: When Hot Water Heating Boilers are connected to Heating Coils located in Air Handling Units where they may be exposed to refrigerated air circulation, the Boiler Piping System must be equipped with Flow Control Valves or other

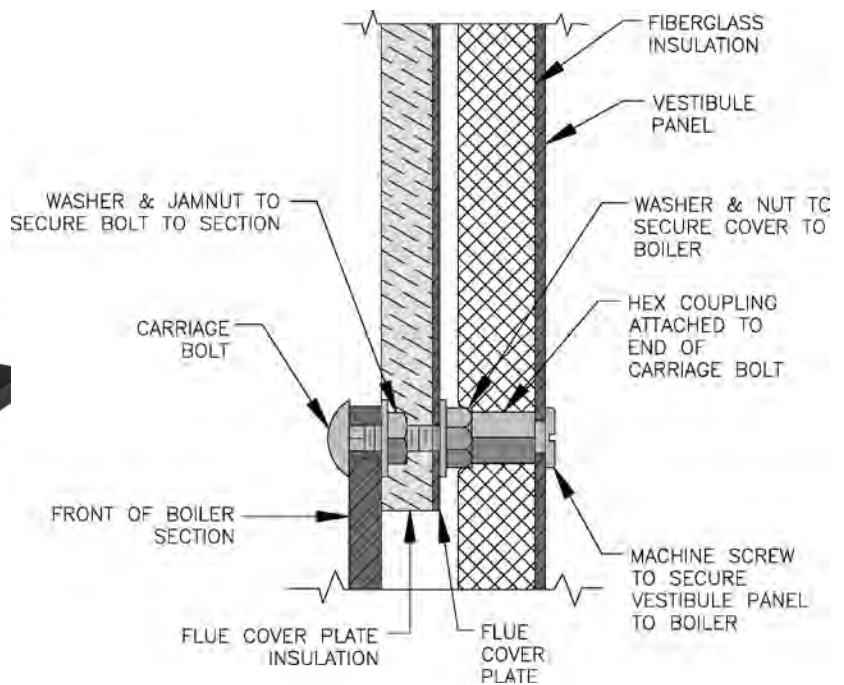


FIG. 11
ATTACHMENT OF FLUE COVERS

- automatic means to prevent gravity circulation of the Boiler Water during the cooling cycle.
- c. With COMBINATION HEATING AND COOLING (REFRIGERATION) SYSTEMS having the same Distributing Units, Piping and Circulator, See Fig. 15. For additional reference, consult ASHRAE Systems Handbook 2008 Edition.
- d. NOTE: Valves must be installed in the supply and return branches to the Heating Boiler and Water Chiller so as to prevent circulation of Chilled Water through the Boiler or Heated Water through the Chiller.

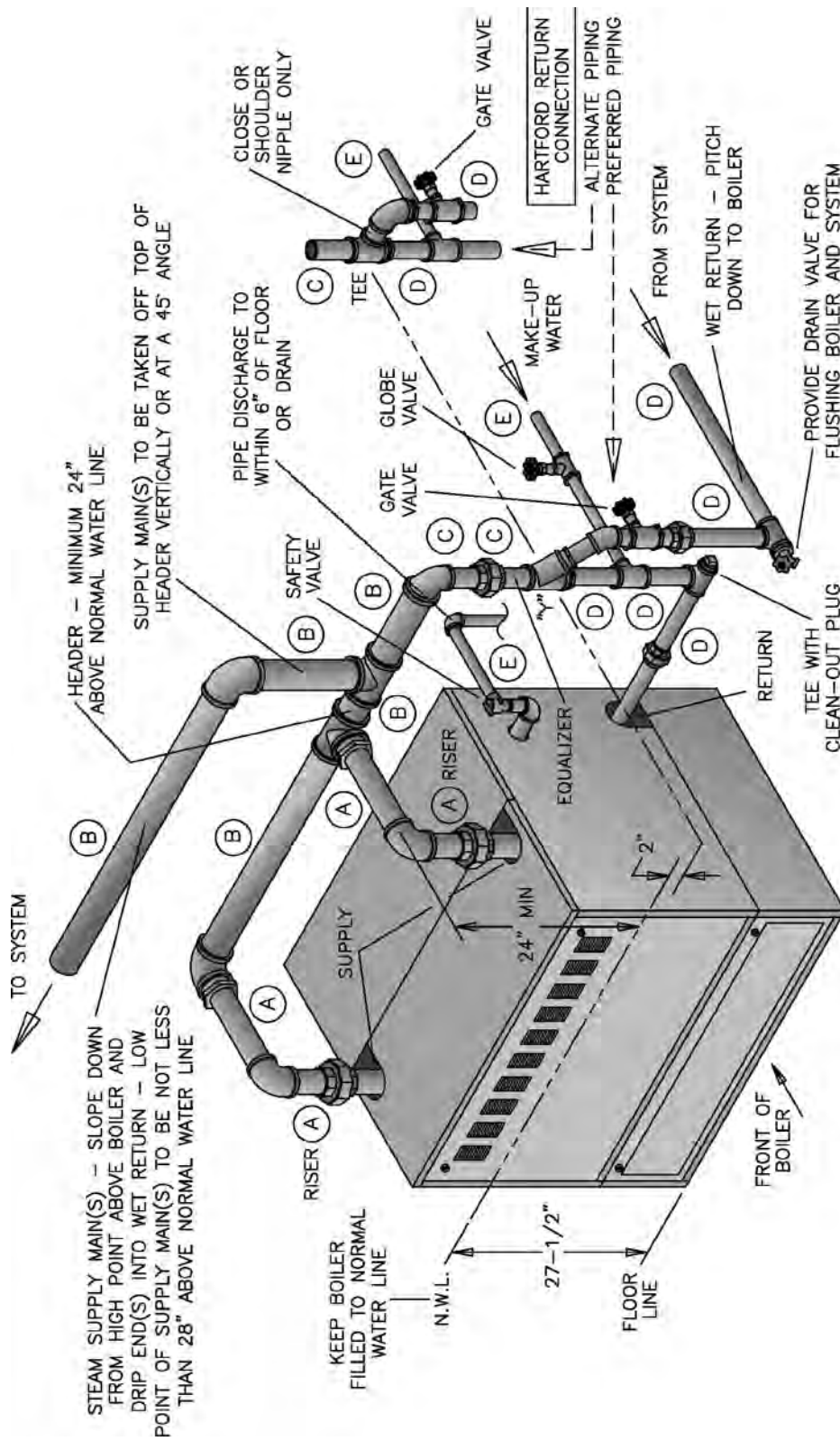
OXYGEN CORROSION:

Oxygen contamination of the boiler water will cause corrosion of the iron and steel boiler components, which can lead to failure. As such, any system must be designed to prevent oxygen absorption in the first place or prevent it from reaching the boiler. Problems caused by oxygen contamination of boiler water are not covered by Burnham's standard warranty.

There are many possible causes of oxygen contamination such as:

1. Addition of excessive make-up water as a result of system leaks.
2. Absorption through open tanks and fittings.
3. Oxygen permeable materials in the distribution system.

In order to insure long product life, oxygen sources should be eliminated. This can be accomplished by taking the following measures:



MINIMUM PIPE SIZE

	5006**	5007**	5008	5009	5010	5011	5012	5013	5014
A	3"	3"	3"	3"	3"	3"	3"	3"	3"
B	3"	3"	4"	4"	4"	4"	5"	5"	5"
C	2"	2"	2"	2"	2-1/2"	2-1/2"	2-1/2"	2-1/2"	2-1/2"
D	1-1/2"	1-1/2"	1-1/2"	1-1/2"	2"	2"	2"	2"	2"
E	3/4"	3/4"	3/4"	1"	1"	1"	1-1/4"	1-1/4"	1-1/4"

** SECOND SUPPLY RISER OPTIONAL

FIG. 12
RECOMMENDED STEAM BOILER PIPING, GRAVITY RETURN
1 OR 2 SUPPLY CONNECTIONS - 5006B THRU 5014B

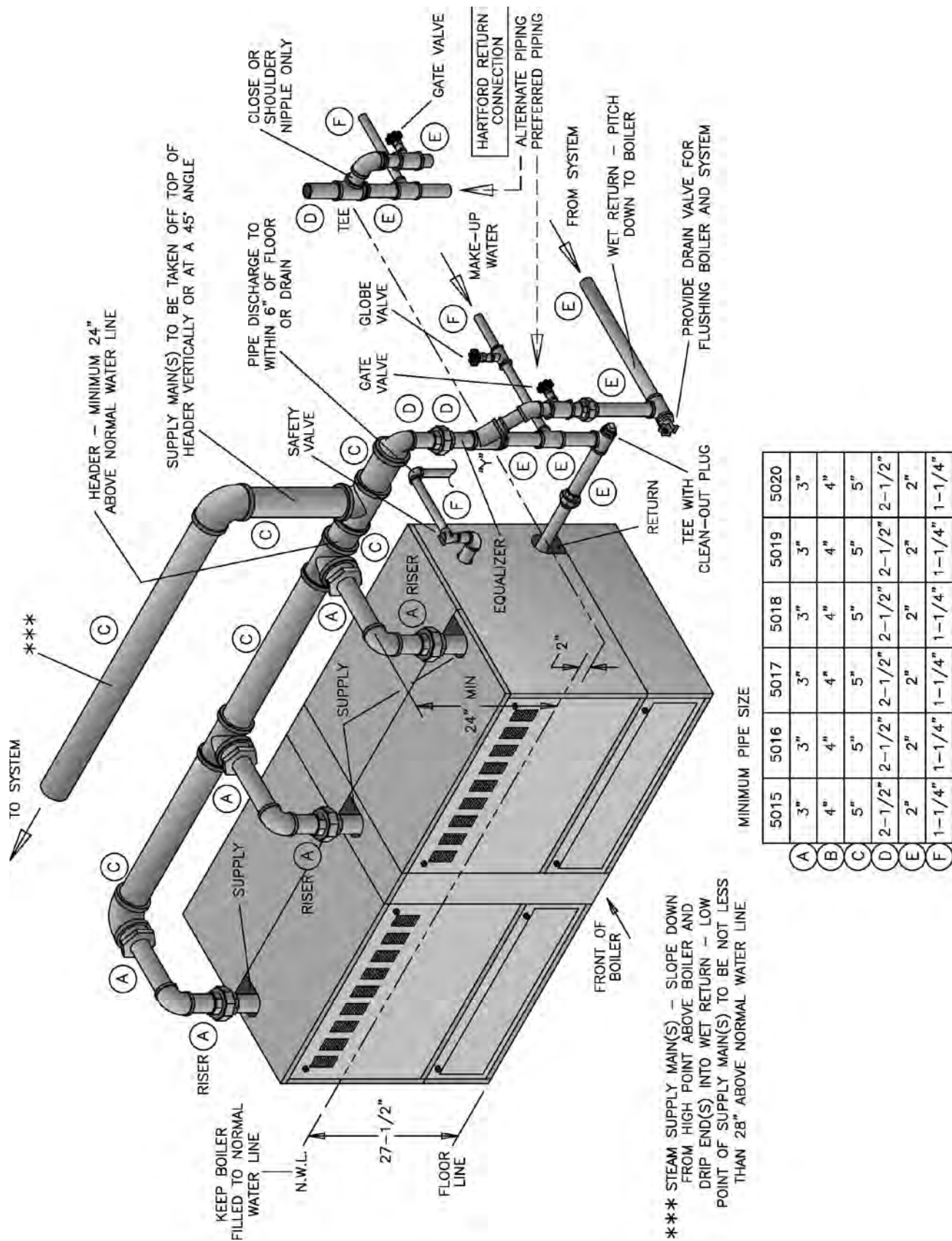


FIG. 13A
RECOMMENDED STEAM BOILER PIPING, GRAVITY RETURN
3 SUPPLY CONNECTIONS - 5015B THRU 5020B

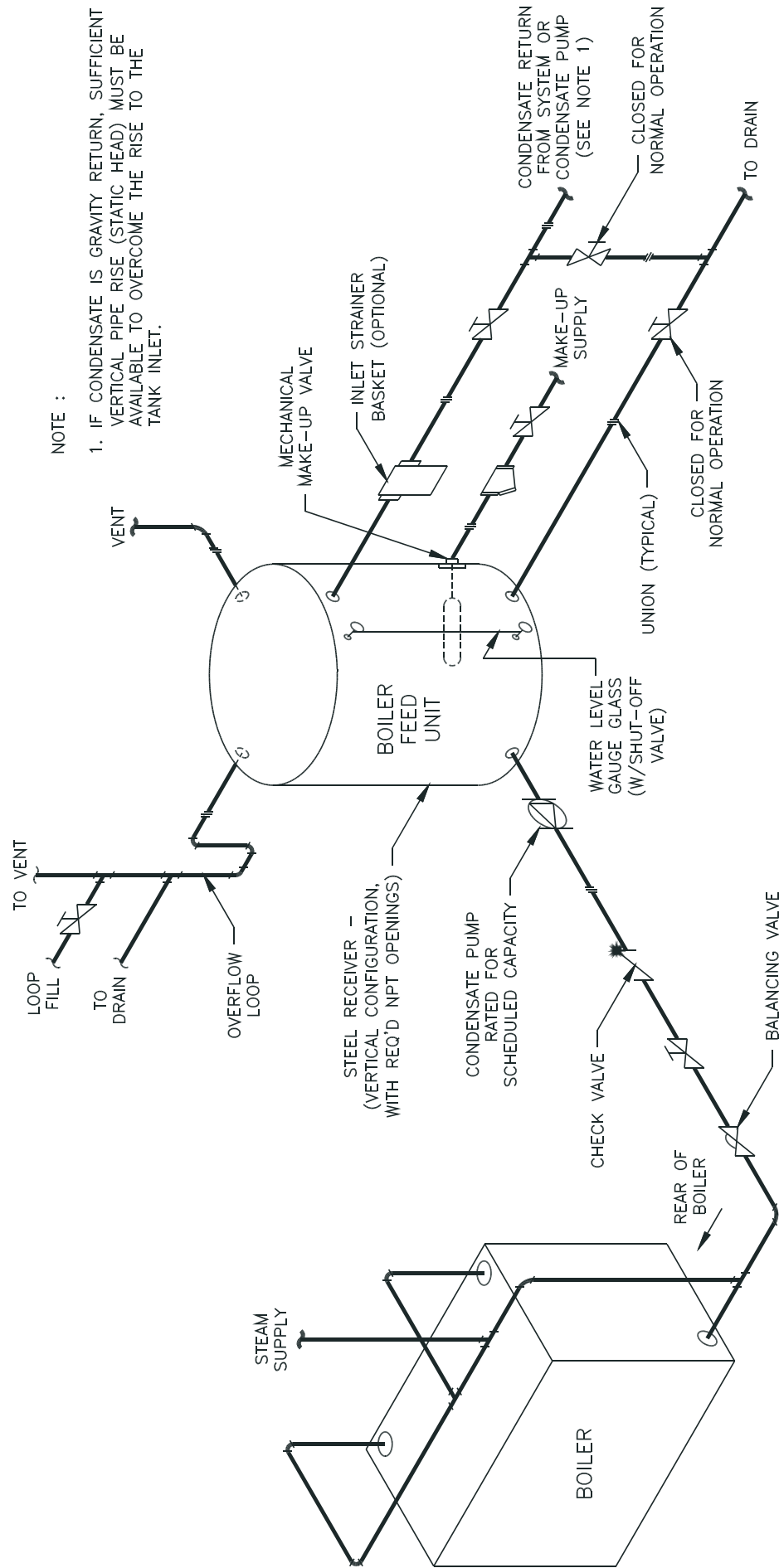


FIG. 13C
TYPICAL STEAM PIPING ARRANGEMENT FOR BOILERS WITH PUMPED CONDENSATE RETURN AND BOILER FEED UNIT

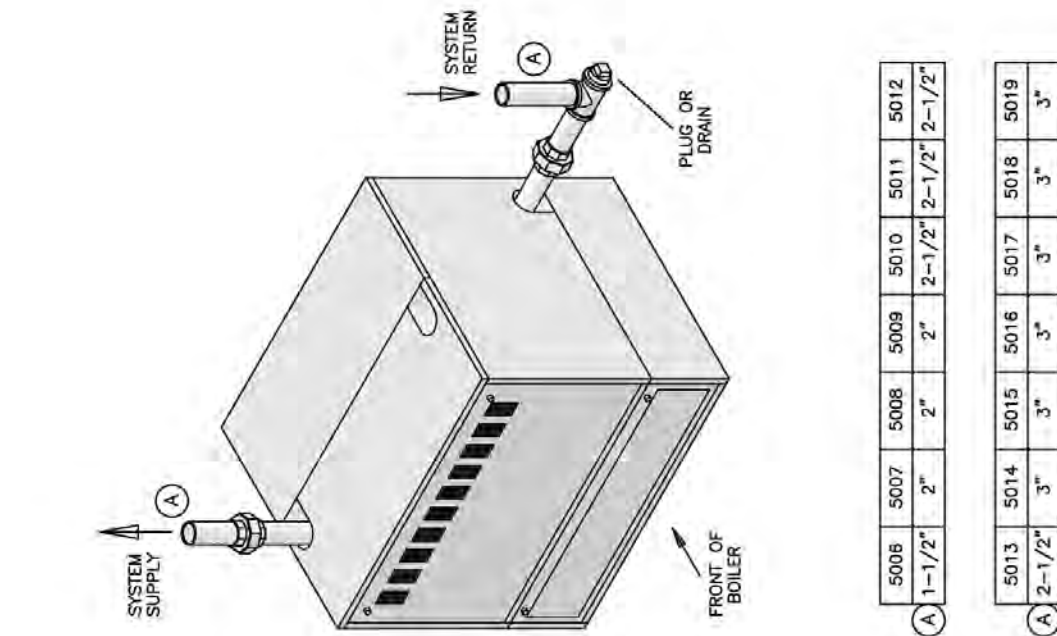


FIG. 14A
RECOMMENDED WATER BOILER PIPING
1 SUPPLY CONNECTION & 1 RETURN CONNECTION
SIZES 5006B THRU 5019B

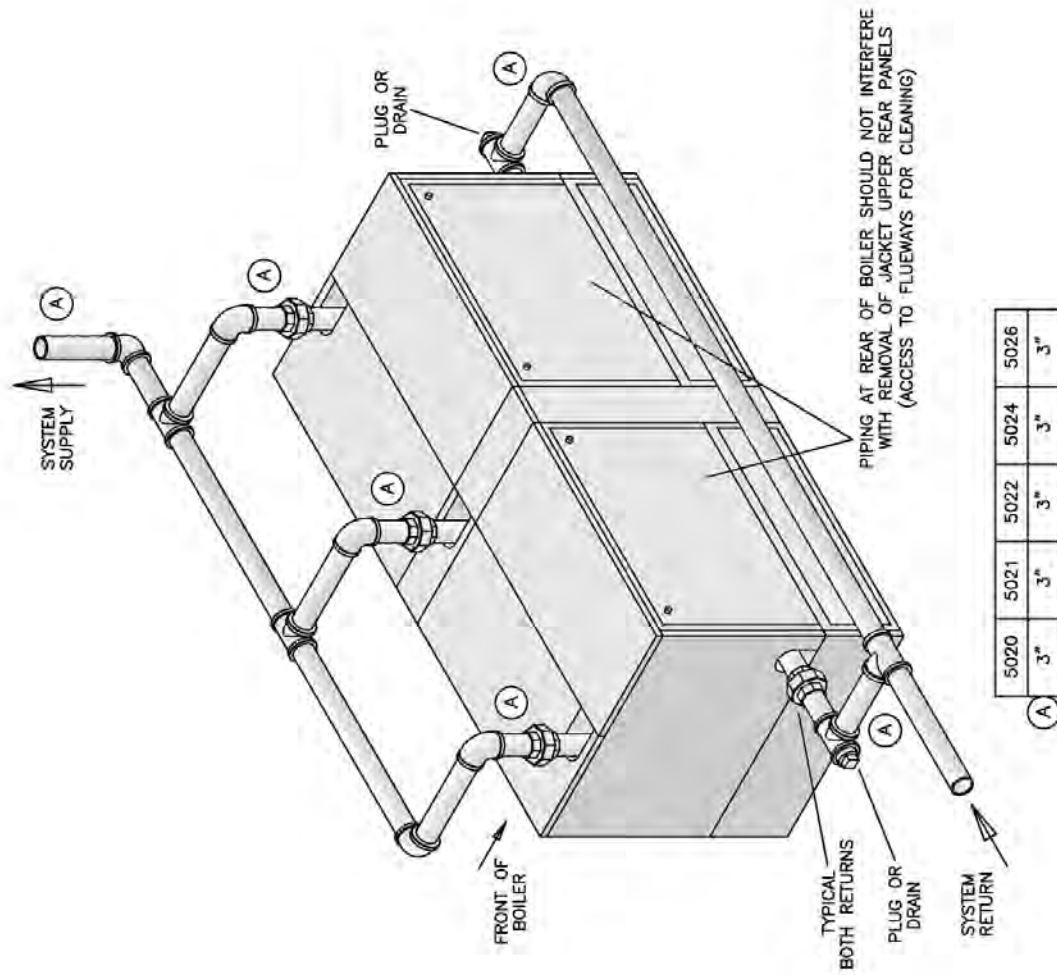


FIG. 14B
RECOMMENDED WATER BOILER PIPING
3 SUPPLY CONNECTIONS & 2 RETURN CONNECTIONS
SIZES 5020B THRU 5026B

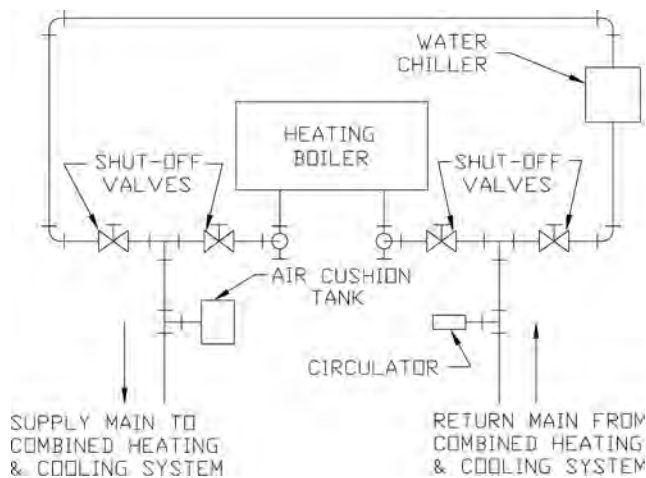


FIG. 15
RECOMMENDED BOILER PIPING FOR
COMBINATION HEATING & COOLING SYSTEMS

1. Repairing system leaks to eliminate the need for addition of make-up water.
2. Eliminating open tanks from the system.
3. Eliminating and/or repairing fittings which allow oxygen absorption.
4. Use of non-permeable materials in the distribution system.
5. Isolating the boiler from the system water by installing a heat exchanger.

Open Jacket Parts Carton

15. INSTALLATION OF JACKET PARTS COMMON TO ALL BOILER SIZES

1. Attach Lower Jacket End Panel Support Bracket to Base End Panel (Both ends) using $\frac{1}{4}$ "-20 x $\frac{1}{2}$ " self-tapping screws, see Fig. 2 and 16.

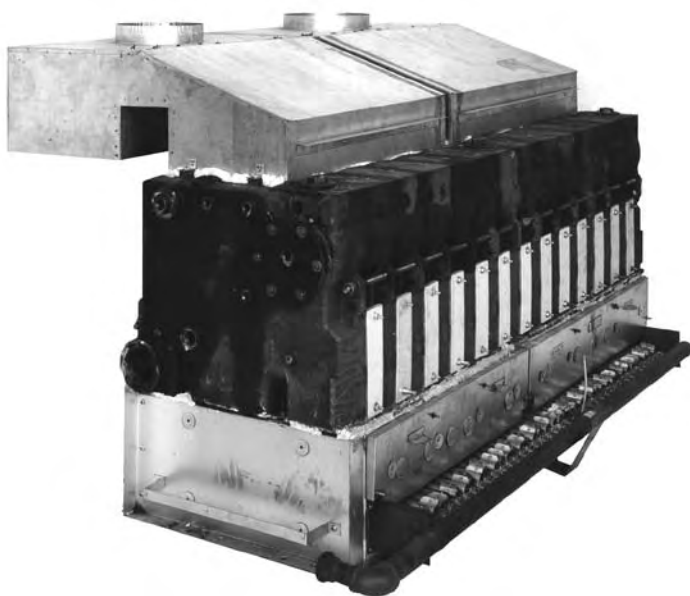


FIG. 16
INSTALLATION OF JACKET SUPPORT
BRACKETS TO BASE END PANELS

2. Attach Lower Left and Lower Right Jacket End Panels to their respective brackets using #10-32 x $\frac{1}{2}$ " self-tapping screws, see Fig. 17.
3. See Fig. 7 "Purpose of Tappings and Their Location" and remove necessary knockouts from Upper Left and from Upper Right Jacket End Panels.
4. Place Upper Right End Panel on top of Lower Right End Panel with lip on bottom of Upper Panel positioned behind Lower Panel. Secure to section using #10-32 x $\frac{1}{2}$ " self-tapping screws. Attach Upper Left End Panel in a similar manner, see Fig. 17.

NOTE: FOR INSTALLATION OF THE FRAMEWORK FOR THE LOWER UNCOMMON JACKET PARTS REFER TO THE FOLLOWING:

- a. 6 thru 10 section boilers – Paragraph 16, Fig. 19
- b. 11 thru 26 section boilers – Paragraph 30, Fig. 23

COMPLETION OF JACKET INSTALLATION – 5006B THRU 5010B SECTION BOILERS

NOTE: Do not tighten any screws until Jacket installation is complete.

INSTALLATION OF LOWER FRAMEWORK

16. With "U" channel facing down, slip upper front channel behind joints formed by End Panels and secure to End Panels using #8 SMS. Position Lower Front Channel so that "U" of channel faces boiler. Slip Lower Front Channel behind Lower End Panels and secure with #8 SMS. Repeat similar procedure for installation of Upper Rear and Lower Rear Channels.
17. INSTALLATION OF VESTIBULE PANEL refer to Fig. 18.

Attach Hex Couplings to end of Carriage Bolts which secure flue cover plates.

NOTE: Select Carriage Bolts which line up with holes in the Vestibule Panel.

18. SECURE VESTIBULE PANEL TO HEX COUPLINGS using $\frac{1}{4}$ "-20 x $\frac{3}{8}$ " slotted pan head machine screws.
19. ATTACH REAR TOP JACKET PANEL TO UPPER END PANELS using #8 SMS. Refer to Fig. 19.
20. INSTALLATION OF CANOPY-DRAFTHOOD 5006B thru 5010B Section Boilers, see Fig. 20. Place Cerafelt strips on top of section assembly next to ledges formed by center sections and next to ledge on end sections. Overlap at corners.
21. SECURE CANOPY-DRAFTHOOD with $\frac{5}{16}$ "-18 x $\frac{5}{8}$ " MS driven into the tapped lugs provided for this purpose on top of the sections. Two screws are required at each end. Refer to Fig. 21.

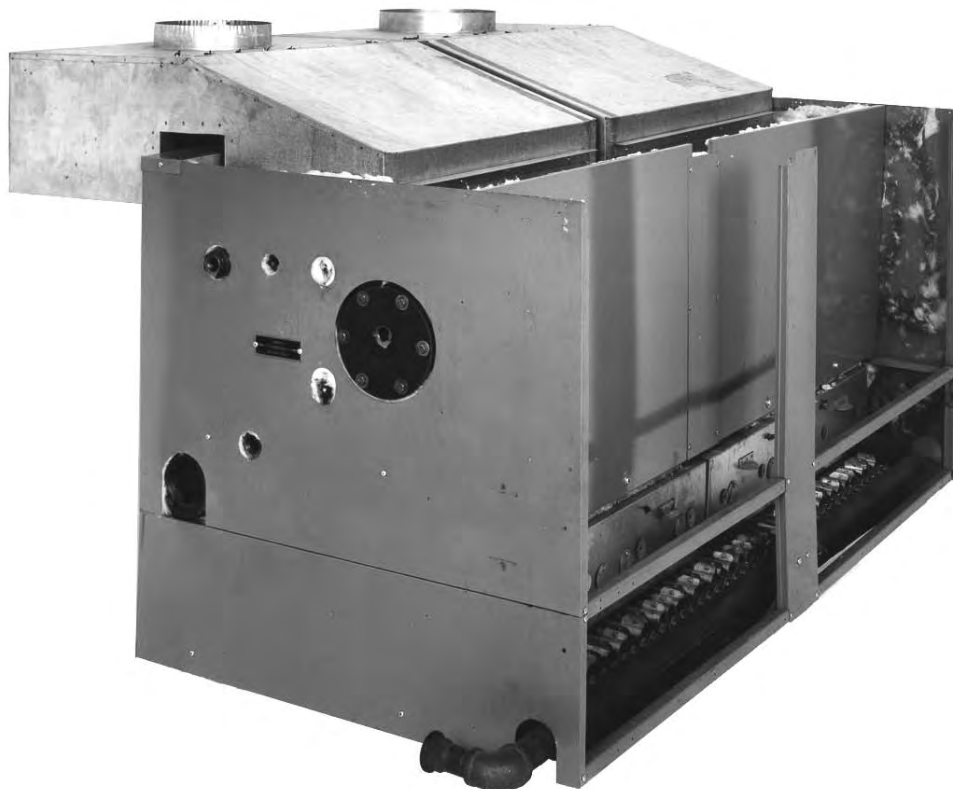


FIG. 17
INSTALLATION OF JACKET END PANELS

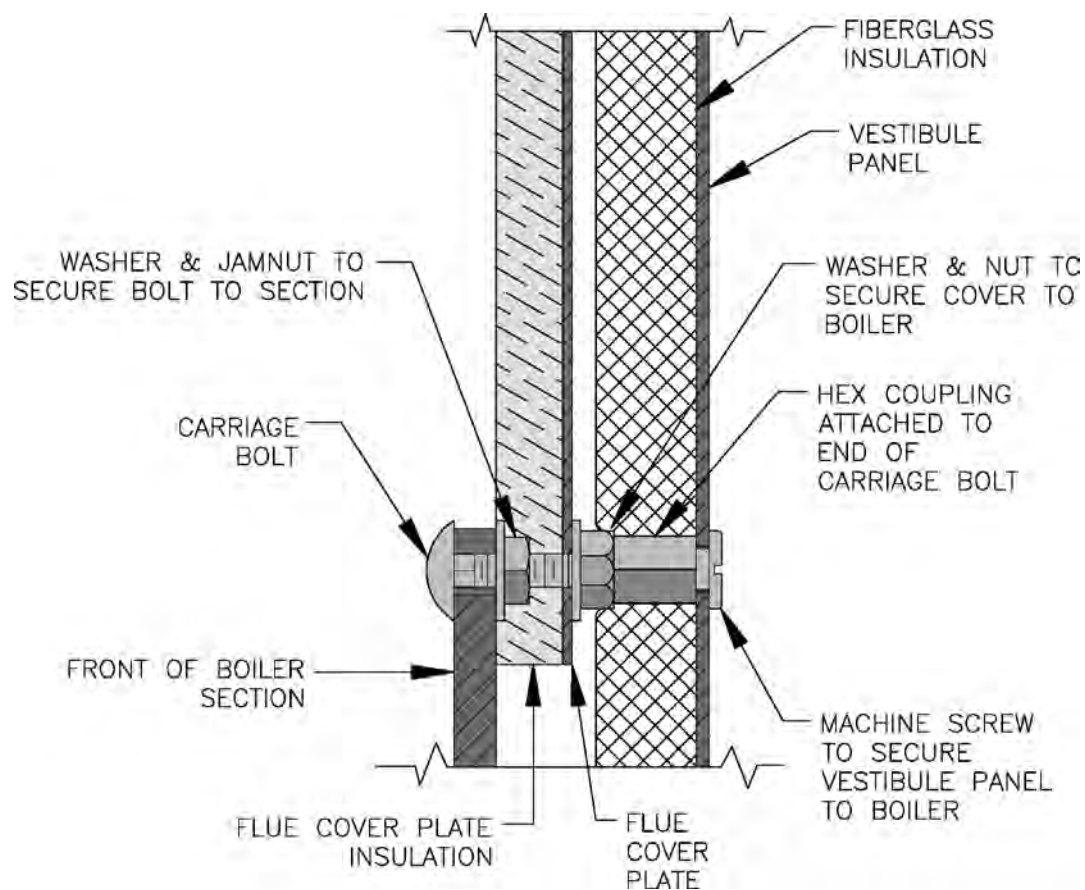


FIG. 18
VESTIBULE ATTACHMENT DIAGRAM

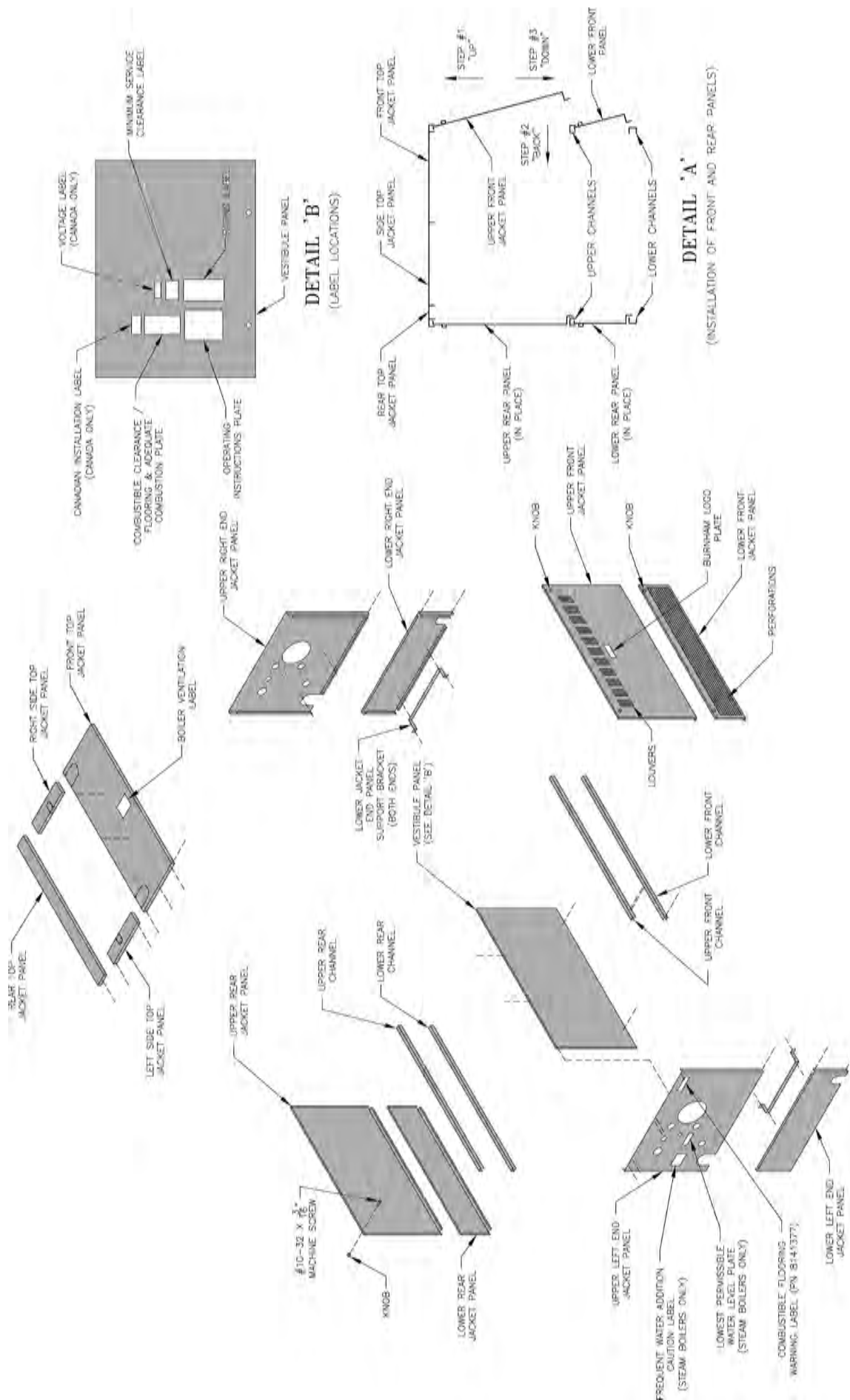


FIG. 19
EXPLODED VIEW OF JACKET
6 THRU 10 SECTION BOILERS

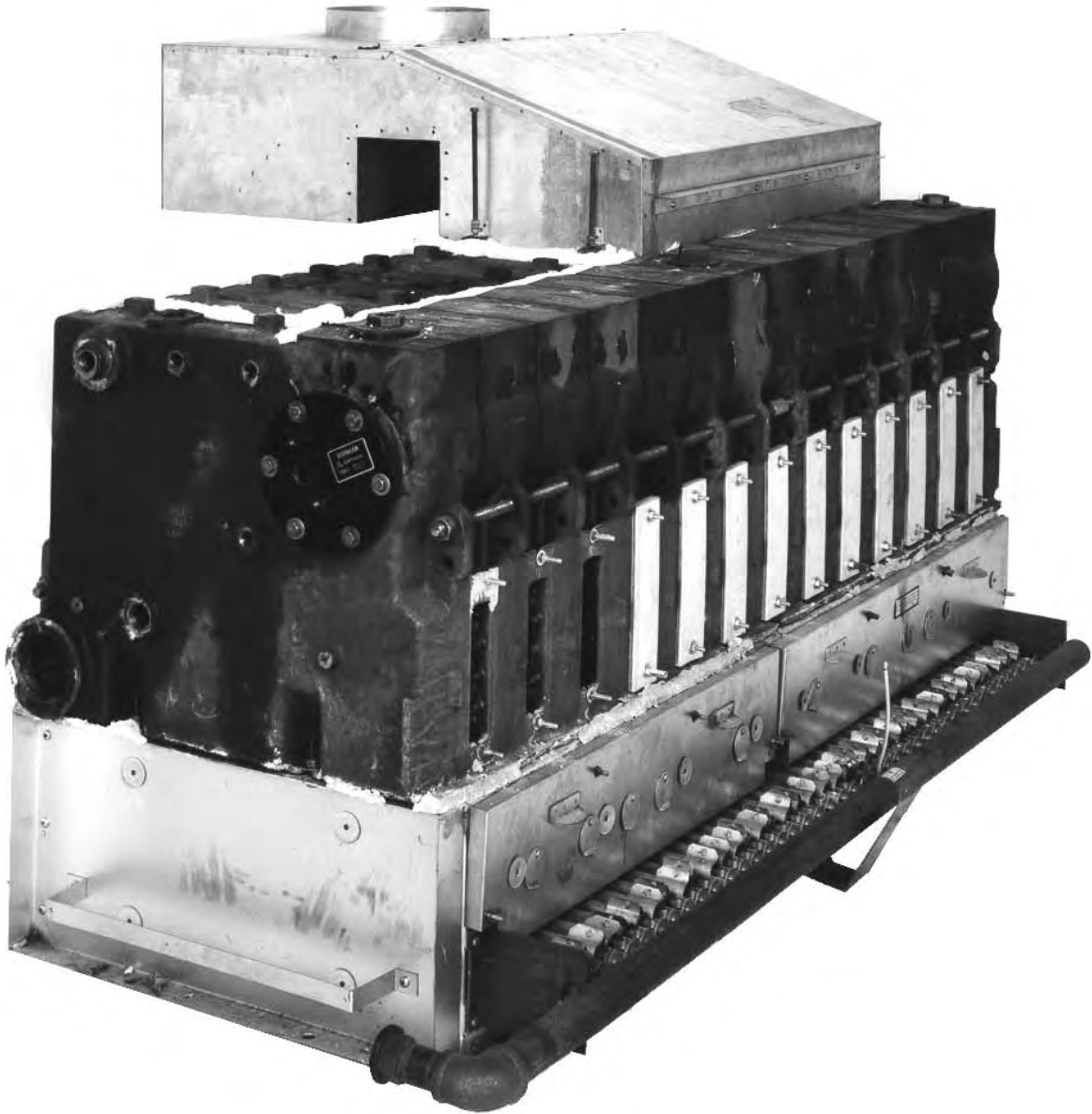
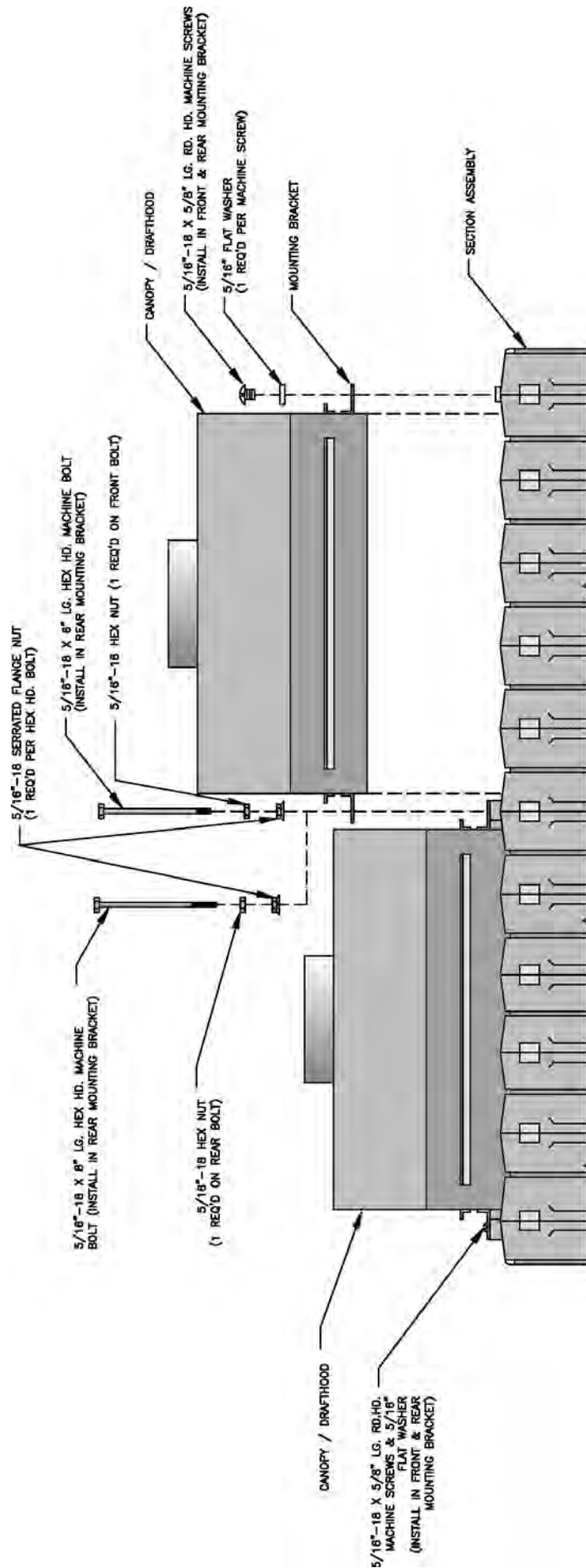


FIG. 20
SECURING OF CANOPY/DRAFTHOOD



NOTE – TO INSTALLER

RUN THE HEX NUTS AND FLANGE NUTS TO THE TOP OF THE THREADS OF THE MACHINE BOLTS. APPROXIMATELY 1/2" OF THREAD WILL BE EXPOSED. MACHINE BOLTS MUST NOT BOTTOM OUT IN TAPPIINGS OR A TIGHT SEAL BETWEEN SECTIONS AND CANOPY / DRAFTHOOD WILL NOT BE OBTAINED.

BOILER MODEL	DESCRIPTION	QTY.
5006-5026	5/16"-18 X 8" LG. MACHINE SCREWS RD. HD.	4
5011-5019	5/16"-18 X 8" LG. HEX HD. MACHINE BOLTS	1
5020-5022	5/16"-18 X 6" LG. HEX HD. MACHINE BOLTS	2
5024-5026	5/16"-18 X 6" LG. HEX HD. MACHINE BOLTS	3
5011-5019	5/16"-18 X 8" LG. HEX HD. MACHINE BOLTS	1
5020-5022	5/16"-18 X 8" LG. HEX HD. MACHINE BOLTS	2
5024-5026	5/16"-18 X 8" LG. HEX HD. MACHINE BOLTS	3

FIG. 21
CANOPY/DRAFTHOOD MOUNTING DIAGRAM

22. INSTALLATION OF TOP FRONT JACKET PANEL
 - a. Remove knockout for supply piping (right or left for water boilers – both knockouts for steam boilers) refer to recommended boiler piping diagrams in this manual.
 - b. Attach Top Front Jacket Panel to left and right end Jacket Panel and to Top Flange on the Vestibule Panel using #8 SMS. See Fig. 22.
23. INSTALLATION OF LEFT AND RIGHT TOP SIDE JACKET PANEL
 - a. Remove knockout, right or left, only if needed. (See Fig. 7 for purpose of tappings), secure top side panels to upper end panels with #8 SMS.
24. INSTALL KNOBS on the four remaining panels using #10-32 x 3/16" MS.
25. INSTALL UPPER FRONT, LOWER FRONT, UPPER REAR AND LOWER REAR PANELS using procedure described in detail "A" of Fig. 23.

CAUTION

Panel with louvers must be at front of boiler for ventilation of vestibule. Panel with perforations must be at front of boiler for ventilation and combustion air.

26. TIGHTEN ALL SHEET METAL SCREWS.
27. INSTALL THE FOLLOWING PLATES OR LABELS which are found in the Instruction Envelope. See Fig. 19 or 22 for location.
 - (1) Rating Label
 - (2) Operating Instruction Plate (#8 SMS required to fasten)
 - (3) Combustible Clearance Flooring & Adequate Combustion Plate
 - (4) Minimum Service Clearance Label (self-adhesive)
 - (5) Burnham Logo (self-adhesive) – Apply to Top Panel
 - (6) Boiler Ventilation For Your Safety Label – Apply to Top Panel
 - (7) Proceed to Paragraph 33 (Steam Boilers) or Paragraph 34 (Water Boilers).

COMPLETION OF JACKET INSTALLATION 11 THRU 26 SECTION BOILERS.

28. PARAGRAPHS 1 THRU 4 HAVE ALREADY BEEN COMPLETED. Refer to Paragraph 16 for installation of lower framework.
 - a. Install Vestibule Panel(s) – refer to Fig. 19 and 22. Attach Hex Couplings to end of Carriage Bolts which secure Flue Cover Plates.

NOTE: Select Carriage Bolts which line up with holes in the Vestibule Panel(s).

 - b. Attach Intermediate Vestibule Panel(s) to one of the Vestibule Panel(s) using #8 SMS.

- c. Secure Left and Right Vestibule Panels to Hex Couplings using 1/4"-20 x 3/8" slotted pan head machine screws.
- d. Attach the Lower Rear Intermediate Panels to the Lower Rear Intermediate Panel Support Bracket(s) using #10-32 x 1/2" self tapping screws.
- e. Attach the Upper Rear Intermediate Panel(s) to the Lower Rear Intermediate Panel(s) using #8 SMS.
- f. Attach Rear Top Intermediate Jacket Panel(s) to Rear Top Left and Right Jacket Panels using #8 SMS.
- g. Place Assembled Rear Top Jacket Panel in position and attach to Upper End Panels and Upper Rear Intermediate Panel using #8 SMS.
- a. INSTALLATION OF CANOPY-DRAFTHOOD 11 THRU 26 SECTION BOILERS – these boilers require two or more Canopy-Drafthoods – refer to Fig. 6 for proper arrangement. Determine where ends of Canopy-Drafthood rest on intermediate sections. Place 1" x 14-1/2" Cerafelt strips on top of intermediate section at these locations. Place Cerafelt strips on top of section assembly next to ledges formed by center sections and next to ledges on end sections. Overlap at corner.
- b. SECURE CANOPY-DRAFTHOODS with machine screws and bolts as shown in Fig. 21. Select the type of fastener indicated and drive them into the Tapped Lugs provided for this purpose on top of the sections. Where two Canopy-Drafthoods join together, the securing tabs will overlap.
- c. Attach the Front Intermediate Panel to the Front Intermediate Panel Support Bracket(s), using #10-32 x 1/2" self tapping screws.

29. INSTALLATION OF TOP FRONT JACKET PANELS

- a. Remove knockout for supply piping. Refer to recommended boiler piping diagrams in this manual.
 - b. Attach Top Front Jacket Panels to left and right end Jacket Panels and also to top flange on the Vestibule Panel using #8 SMS. Refer to Fig. 23 or 24.
30. PLACE TOP INTERMEDIATE PANEL(S) ON TOP OF LEFT AND RIGHT PANELS, making sure that Front Intermediate Panel(s) is under Top Intermediate Panel(s). Secure Top Intermediate Panel using #8 SMS.
 31. INSTALL KNOBS ON THE UPPER FRONT AND UPPER REAR PANELS using #10-32 x 3/16" MS. Install Upper Front, Lower Front, Upper Rear and Lower Rear Panels using procedure we described in detail "A" of Fig. 23 or 24.

CAUTION

Panel with louvers must be at front of boiler for ventilation of vestibule. Panel with perforations must be at front of boiler for ventilation and combustion air.

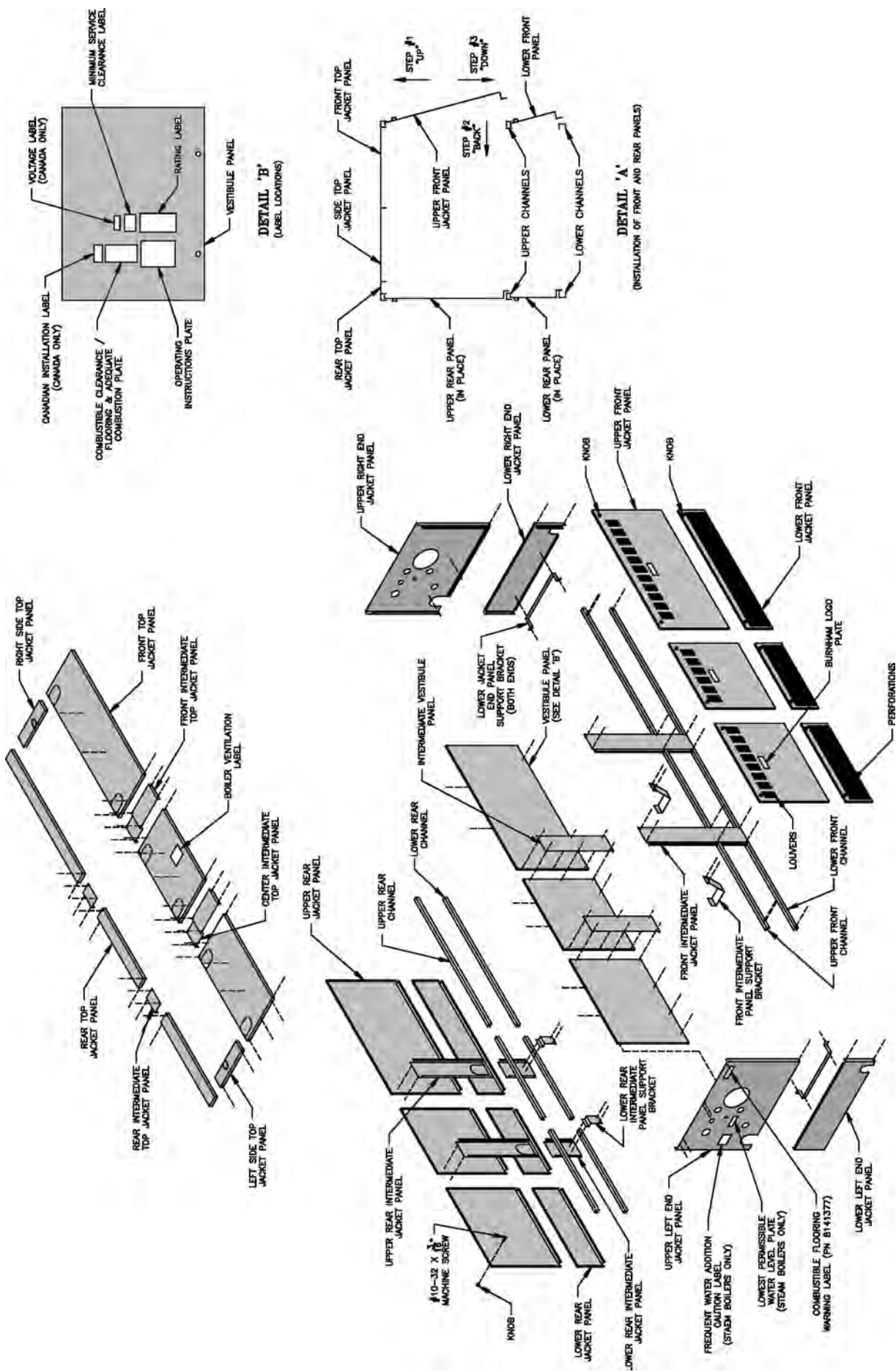


FIG. 23
EXPLODED VIEW OF JACKET
20 THRU 22 SECT. BOILERS

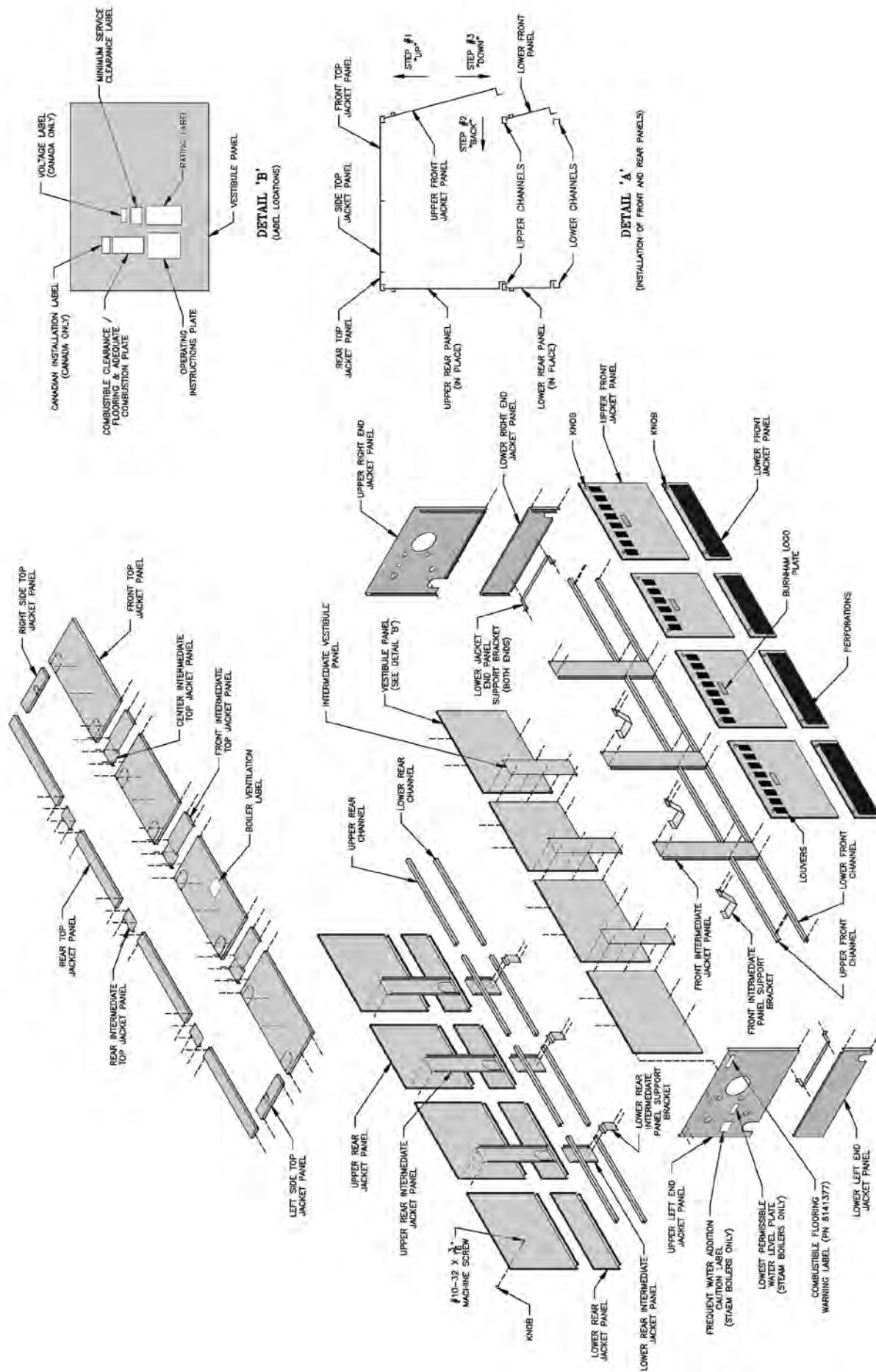


FIG. 24
EXPLODED VIEW OF JACKET
24 AND 26 SECT. BOILERS

32. TIGHTEN ALL SHEET METAL SCREWS.

- a. Install the following plates or labels which are found in the Instruction Envelope. See Fig. 23 or 24 for location.
 - (1) Rating Label
 - (2) Operating Instruction Plate (#8 SMS required to fasten)
 - (3) Combustible Clearance Flooring & Adequate Combustion Plate
 - (4) Minimum Service Clearance Label
 - (5) Burnham Logo – Apply to Top Panel
 - (6) Boiler Ventilation/For Your Safety Label
- b. Proceed to Paragraph 33 (Steam Boilers) or Paragraph 34 (Water Boilers).

NOTE: IF WATER BOILER, PROCEED DIRECTLY TO Paragraph 34.

33. INSTALL STEAM TRIM AND CONTROLS, See Fig. 7 and 25.

- a. Pressure Gauge is to be installed with 1/2" nipple and 1/2" x 1/4" reducing coupling in 1/2" tapping provided in upper corner of End Section using wrench applied to square shank on back of gauge. **DO NOT APPLY FORCE ON GAUGE CASE.**
- b. Install 67BC-2 Low Water Cut-Off or 47-2 Combination Feeder and Low Water Cut-Off in accordance with the Instructions packed with the control. 1/2" pipe extensions are provided and must be installed in the 1/2" tappings adjacent to the Pressure Gauge before the control can be mounted. Unions are furnished with the 67BC-2 Low Water Cut-Off for ease of installation. 1" pipe tappings have been provided in the End Sections for other types of Low Water Cut-Offs and Low Water Cut-Off & Feeder combinations. Fig. 25A illustrates the required mounting elevations for a M&M 150 and a 67M float LWCO. Figure 13C illustrates a

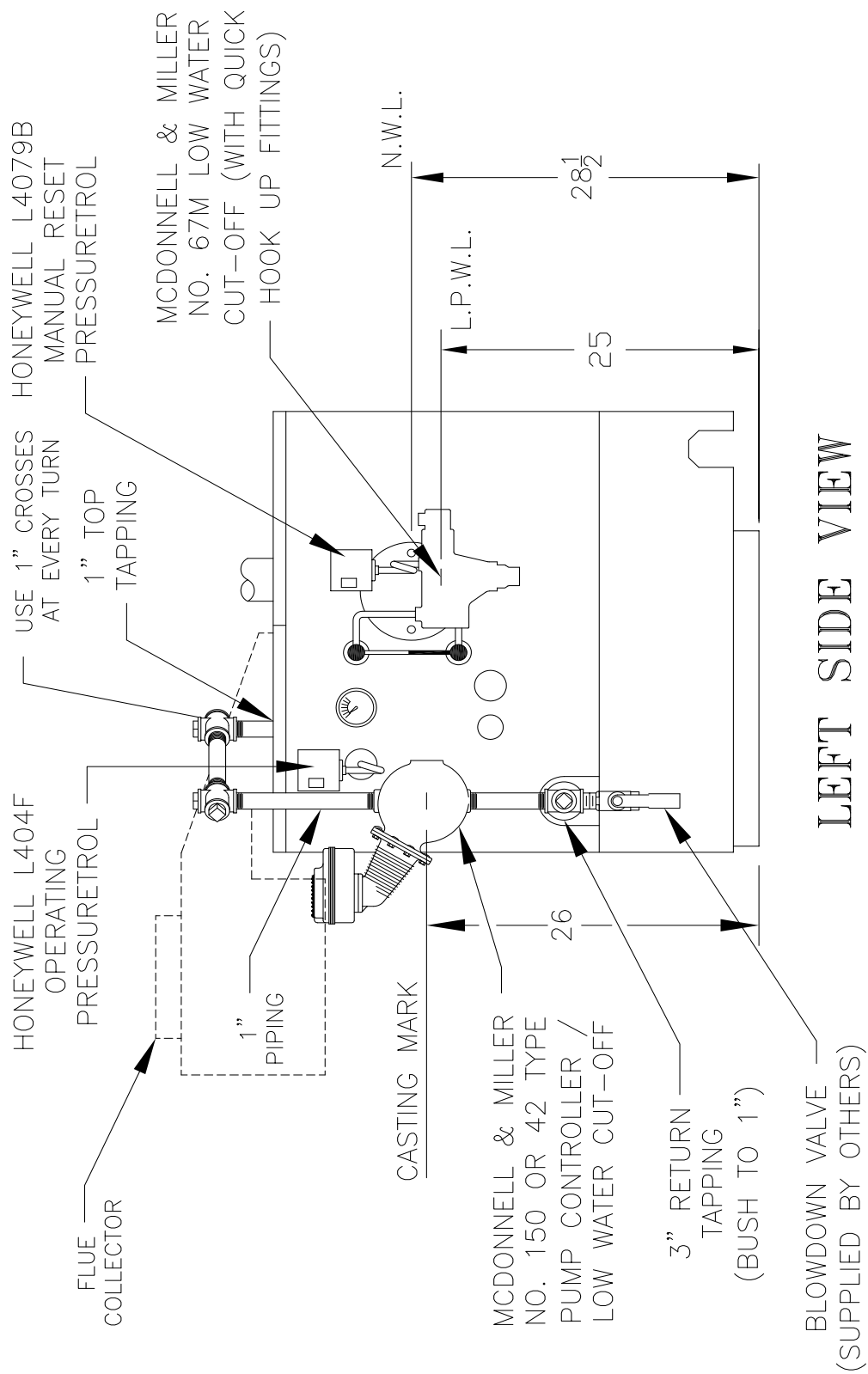


FIG. 25
STEAM TRIM AND CONTROLS

typical steam piping arrangement for pumped return systems.

- c. Install Gauge Glass Fittings into ends of tees used to connect the 67BC-2 or 47-2 Control. If other control is furnished, install Gauge Glass Fitting directly into 1/2" pipe extensions.
- d. Install Pressure Limit Controls as follows:
 - (1) Boiler equipped with 67BC-2 Low Water Cut-Off – Connect Pressure Limit furnished to 1/4" street ell and 1/4" pigtail siphon. For installation of second pressure limit (not furnished), bush 1 1/2" pipe tapping in upper corner of End Section. Connect Pressure Limit to this bushing with 1/4" pigtail siphon.
 - (2) Boiler equipped with Low Water Cut-Off other than (1) above or with Low Water Cut-Off Feeder Combination – Bush 1 1/2" pipe tapping in upper corner of End Section and connect Pressure Limit furnished to this bushing with 1/4" pigtail siphon. For installation of second pressure limit bush any available tapping on opposite end section that is above normal water line. Connect Pressure Limit to this bushing with 1/4" pigtail siphon.
 - (3) Tighten limit controls by using wrench on hex fitting at bottom of control.
 - (4) The L404 Pressuretrol must be accurately leveled for proper operation. It is level when the leveling indicator hangs freely with its pointer directly over the index mark inside the back of the case. Level the controller by carefully bending the steam trap (siphon loop).
- e. Install Pressure Safety Valve with fittings furnished, into 1 1/2" pipe tapping in upper corner of End Section, see Fig. 12. **DO NOT INSTALL A SHUTOFF VALVE BETWEEN SAFETY VALVE AND BOILER.** If this boiler tapping is to be used as Surface Blowoff, replace ell with tee and plug open end of tee or valve off opening. Pressure Safety Valve must be in leg of tee and in a vertical position with handle up.
- f. Install Boiler Drain Valve and 3" x 3/4" Bushing into one of the two return tappings. The drain valve may also be installed in return piping, but it must be installed in the leg of a tee so that it is directly opposite and as close as possible to the return tapping. The leg of the tee must be at least 1 1/2" pipe size.

A Bottom Blowoff using a valve must also be connected to one of the return tappings. The 3/4" Drain Valve may be used for Bottom Blowoff for 5009B or smaller boilers, since any Bottom Blowoff piping or valves for 5009B or smaller boilers must be at least 3/4". Bottom Blowoff piping and valves for Boilers 5010B through 5021B must be at least 1". Bottom Blowoff piping and valves for 5022B Boilers and larger must be at least 1 1/4".



NOTE: CONDENSATE RETURN SHOULD BE PIPED INTO
RIGHT SIDE RETURN TAPPING

FIG. 25A
MOUNTING ELEVATIONS OF M&M 150 AND A 67M FLOAT LWCO

- g. If boiler has been ordered with 3/8" try-valve tapping, install try-cock.
- h. Install "Lowest Permissible Water Level Plate" and "Frequent Water Addition – Caution Label" on upper left end jacket panel.
- i. Proceed directly to Paragraph 36.



FIG. 26
WATER TRIM AND CONTROLS

34. INSTALL WATER TRIM AND CONTROLS, see Fig. 7 and 26.

- a. Temperature Gauge is to be installed with 1/2" nipple and 1/2" x 1/4" reducing coupling in 1/2" tapping provided in upper corner of End Section using wrench applied to square shank on back of gauge. DO NOT APPLY PRESSURE ON GAUGE GLASS.
- b. Install Temperature Limit Controls as follows:
Bush 1-1/2" tapping in upper corner of End Section to 3/4" and install Temperature Limit Control furnished following instructions supplied with control. On boilers without Built-in Tankless Heater, install second temperature limit control (not furnished) in Tapped Heater Opening Cover Plate. On boilers with Built-in Tankless Heater, install operating control in 3/4" tapping in Heater Plate-plug tapping in Second Heater when supplied.
- c. On boilers equipped for forced circulation hot water heating without domestic hot water, a reverse acting circulator control may be needed to prevent condensation of flue gases during periods of low boiler water temperature. This control can be installed in the Tapped Heater Opening Cover Plate.
- d. TANKLESS HEATER PERFORMANCE

Tankless heater ratings in Series 5B boilers are based on continuous draw, temperature rise of 100°F

(40-140°F) and boiler water temperature of 200°F. Some of the items affecting the coil performance are as follows:

- (1) FLOW REGULATION – If flow through the heater is greater than its rating, the supply of adequate hot water may not be able to keep up with the demand. For this reason a FLOW REGULATOR matching the heater rating should be installed in the cold water line to the heater.
- (2) FLUSHING OF HEATER - All water contains some sediment which settles on the inside of the coil. Consequently, the heater should be periodically back-washed. This is accomplished by installing hose bibs as illustrated and allowing water at city pressure to run into hose bib A, through the heater, and out hose bib B until the discharge is clear. The tees in which the hose bibs are located should be the same size as heater connections to minimize pressure drop.
- (3) HARD WATER – This is applicable to some city water and particularly to well water. This should not be a deterrent but precautions are necessary. A water analysis is necessary and an appropriate water softener installed. This is not only beneficial to the heater but to piping and fixtures plus the many other benefits derived from soft water.

NOTE: A hot water boiler installed above radiation level must be provided with a low water cut-off device as part of the installation.

WARNING

Install automatic mixing valve at tankless heater outlet to avoid risk of burns or scalding due to excessively hot water at fixtures. Adjust and maintain the mixing valve in accordance with the manufacturers instructions.

- e. Following recommendations supplied with control, install #64 Low Water Cut-Off in 1" pipe tapping "H" (Fig. 7) and System Return Piping. Control must be mounted so that cut off point is above marking on Lowest Permissible Water Line Plate.
- f. Install Pressure Safety Relief Valve, using fittings furnished, into 1-1/2" pipe tapping in upper corner of End Section. DO NOT INSTALL A SHUTOFF VALVE BETWEEN SAFETY RELIEF VALVE AND BOILER. Safety Relief Valve must be installed in a Vertical Position with handle up.
- g. Install Boiler Drain Valve into one of unused return tappings that has been bushed to 3/4". Drain Valve can also be installed in return piping, preferably in leg of tee that is located in line with return connection on Boiler.

35. CONNECT PIPING TO BUILT-IN HEATER(S) IF USED, see Fig. 27.

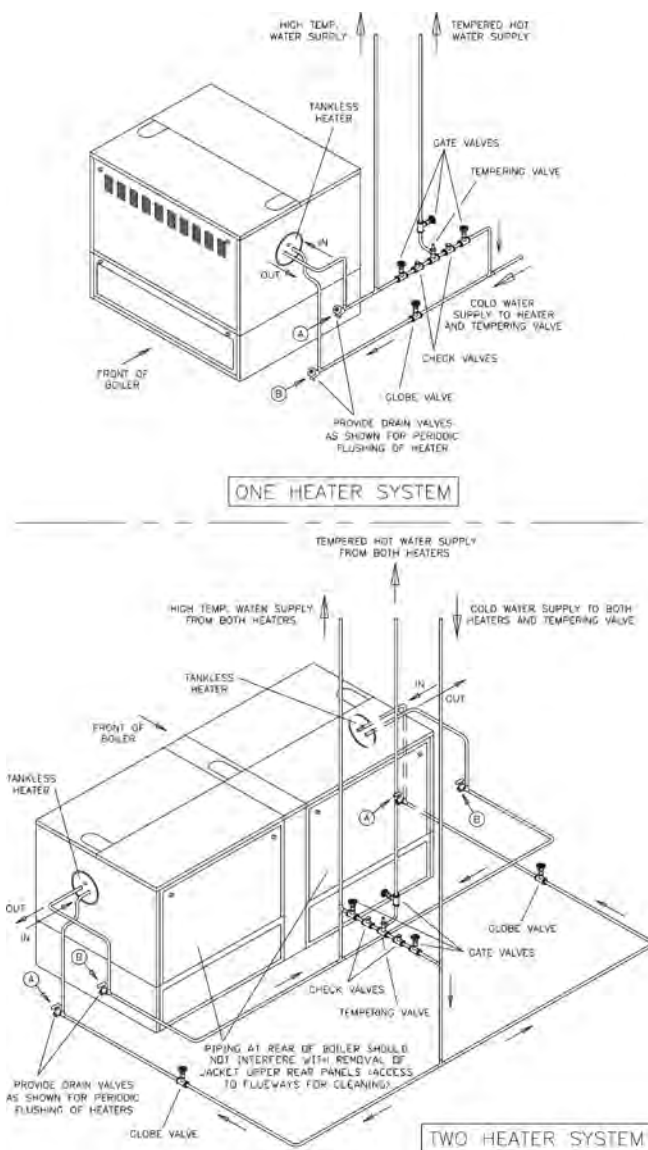


FIG. 27
RECOMMENDED PIPING TO
BUILT-IN TANKLESS HEATERS

36. OPEN GAS TRAIN CARTON(S)

CONNECT GAS TRAIN(S) TO ELBOW ON END OF MANIFOLD(S) according to the Gas Trains on pages 96, 97, 98, 99, 100, 101 or 102.

PRESSURE TESTING of gas service piping must be done before connecting to the boiler gas train. Test for leaks by introducing, from an isolated source, air or inert gas to the piping. Piping shall withstand 3 PSI gage pressure for a period of not less than 10 minutes without showing any drop in pressure.

37. A DRIP LEG SHOULD BE PROVIDED IN THE VERTICAL DROP TO EACH GAS TRAIN, see Fig. 1. An additional Manual Shut-off valve and ground joint union, as show in Fig. 1, should be installed in the piping to each gas train for ease of servicing.

CONNECT GAS SERVICE FROM METER TO GAS TRAIN in accordance with the requirements of the authority having jurisdiction or, in the absence of such

TABLE I - NATURAL GAS
Maximum Capacity of Piping in Cubic Feet of Gas Per Hour
(Based on a Pressure Drop of 0.3" Water
and 0.6 Specific Gravity)

Pipe Length in Feet	NOMINAL IRON PIPE SIZE IPS INCHES							
	¾	1	1¼	1½	2	2½	3	4
10	278	520	1050	1600	3050	4800	8500	17500
20	190	350	730	1100	2100	3300	5900	12000
30	152	285	590	890	1650	2700	4700	9700
40	130	245	500	760	1450	2300	4100	8300
50	115	215	440	670	1270	2000	3600	7400
60	105	195	400	610	1150	1850	3250	6800
70	96	180	370	560	1050	1700	3000	6200
80	90	170	350	530	990	1600	2800	5800
90	84	160	320	490	930	1500	2600	5400
100	79	150	305	460	870	1400	2500	5100
125	72	130	275	410	780	1250	2200	4500
150	64	120	250	380	710	1130	2000	4100
175	59	110	225	350	650	1050	1850	3800
200	55	100	210	320	610	980	1700	3500

TABLE II
Multipliers to be used with Table I when Pressure Drop is not 0.3"

Pressure Drop	Multiplier
0.1	.577
0.2	.815
0.5	1.29
1.0	1.83
0.3	1.00

TABLE III
Multipliers to be used with Tables I and II for
Specific Gravity Other than 0.60

Specific Gravity	Correction Factors
.50	1.10
.55	1.04
.60	1.00
.65	.96
.70	.93

requirements to the –

USA – “National Fuel Gas Code, ANSI Z223.1”.

CANADA – “Installation Codes for Natural and LP Gas Burning Appliances and Equipment, CAN/B149.1 & .2”.

The size of the gas train(s) is no criteria as to the size of the service from the meter to the gas train(s). Sizing of the service is dependent on:

a. Required supply of gas in cu. ft./hr.

$$= \frac{\text{input of boiler in BTUH}}{\text{heat value of gas, BTU/cu. ft.}}$$

b. Allowable loss of pressure in piping to obtain minimum input pressure indicated on rating label of boiler.

- c. Length of piping in feet and number of elbows – for practical purposes each 90° elbow can be considered as the following equivalent in length of straight pipe:

3/4"	-	2.1 ft.	2"	-	5.2 ft.
1"	-	2.6 ft.	2-1/2"	-	6.2 ft.
1-1/4"	-	3.5 ft.	3"	-	7.7 ft.
1-1/2"	-	4.0 ft.	4"	-	10.1 ft.

- d. Specific gravity of gas

In the absence of requirements of the authority having jurisdiction, the tables below may be used to size natural gas supply piping.

A pipe thread compound resistant to the action of liquefied petroleum gases must be used on all threaded joints in the gas piping.

Pressure testing of the Gas Supply Piping Boiler and its connections is required before placing the boiler in operation.

The boiler and shutoff valve must be disconnected from the gas supply piping system during any pressure testing at pressures greater than 1/2" psig.

The boiler must be isolated from the gas supply piping system during any pressure testing at pressures equal to or less than 1/2 psig.

WITH GAS SUPPLY "OFF" and Service Piping connected to the boiler, open Manual Valve(s) and pilot valve(s) at end of Gas Train(s) and reduce pressure to 1/2 lb. gage pressure. Using soap solution or other approved method check gas train piping, pilot piping, bleed piping and orifices for leaks.

38. **THE INSTALLATION OF THE REMAINDER OF THE GAS CONTROLS IS DEPENDENT ON THE CONTROL SYSTEM FURNISHED.** REFER TO THE TABLE BELOW FOR THE FIGURES IN THIS MANUAL APPLICABLE TO THE VARIOUS CONTROL SYSTEMS OFFERED AS STANDARD OR AS OPTIONAL EQUIPMENT. IF THE CONTROL SYSTEM ORDERED IS NOT LISTED, SPECIAL INSTRUCTIONS HAVE BEEN PREPARED BY THE APPLICATION ENGINEERING DEPARTMENT AND CAN BE FOUND IN THE INSTRUCTION ENVELOPE FURNISHED WITH THE BOILER.

BOILER SIZE	CONTROL SYSTEM	NATURAL GAS				LP				REFERENCE FIGURES
		USA		CANADA		USA		CANADA		
		STD	OPT	STD	OPT	STD	OPT	STD	OPT	
6 thru 9 sect.	EI	X	---	---	X	X	---	---	---	28, 29
10 thru 26 sect.	EI	X	---	---	X	---	---	---	---	28, 30
6 thru 26 sect.	EI		---		X	---	---	---	---	28, 30
6 thru 9 sect.	EO	---	X	---	X	---	X	X	---	31, 32, 33
10 thru 13 sect.	EO	---	X	---	X	X	---	X	---	31, 32, 33
14 sect.	EO	---	X	X	---	X	---	X	---	31, 32, 33
15 thru 24 sect.	EO	---	X	---	X	X	---	X	---	31, 32, 33
26 sect.	EO	---	X	X	---	X	---	X	---	31, 32, 33
6 thru 14 sect.	EE	---	X	---	X	---	---	---	---	33, 34
15 thru 26 sect.	EE	---	X	---	X	---	---	---	---	33, 34
6 thru 14 sect.	EOP	---	X	---	---	---	X	---	---	35, 36
15 thru 26 sect.	EOP	---	X	---	---	---	X	---	---	35, 36
6 thru 14 sect.	EEP	---	X	---	---	---	---	---	---	37
15 thru 26 sect.	EEP	---	X	---	---	---	---	---	---	37
6 thru 13 sect.	Thermocouple	---	---	X	---	---	---	---	---	38
15 thru 24 sect.	Thermocouple	---	---	X	---	---	---	---	---	39

Open Gas Controls Carton(s)

NOTE: On those boilers with two manifolds (15 sect. and larger), two identical sets of Gas Controls are furnished. Hence, the procedure for installing one set is equally applicable to the second set.

EI Control System

1. **INSTALLATION OF GAS VALVE TRANSFORMER AND PILOT PIPING** (for Robertshaw Pilot Piping, see Fig. 29) – Attach the bracket for mounting of the junction box to the lower front corner of the Jacket Upper End Panel using two #10-32 x ½" MS and nuts. Mount junction box to bracket using #8 SMS, see Fig. 25 or 26. Connect pilot solenoid valve to bottom center knockout of J-box using conduit fittings furnished, (V88 Gas Train only) see Fig. 30. Mount transformer on J-box. If Foot Mounted Transformer, connect to

J-box with Straight Connector, BX, Straight Connector and ½" pipe coupling. Drill holes in Jacket and fasten Transformer using SMS. Install RV-12LT pilot line regulator (packed in Gas Train Carton) and other 1/8" pipe fittings as shown in Section VI, Repair Parts (V88 Gas Train only).

Using ¼" OD aluminum tubing, connect the inlet of the pilot solenoid valve to the pilot valve installed in the manual shut off valve in the Gas Train. Using ¼" aluminum tubing, complete installation to Pilot Burner, see Fig. 30 (V88 Gas Train only).

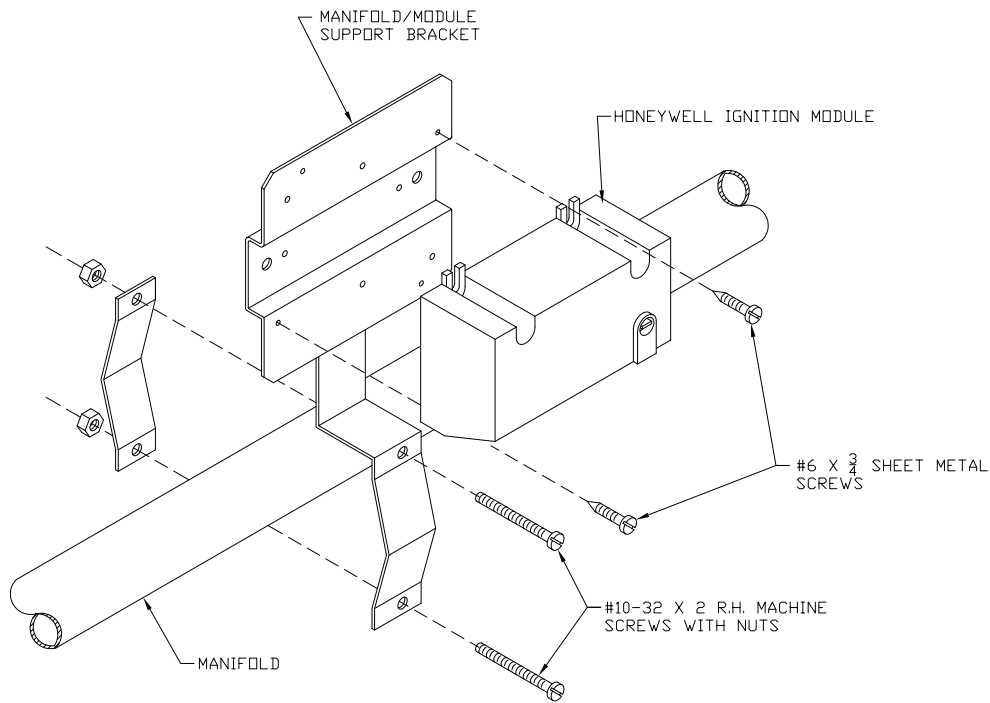


FIG. 28
INSTALLATION OF S8610M MODULE

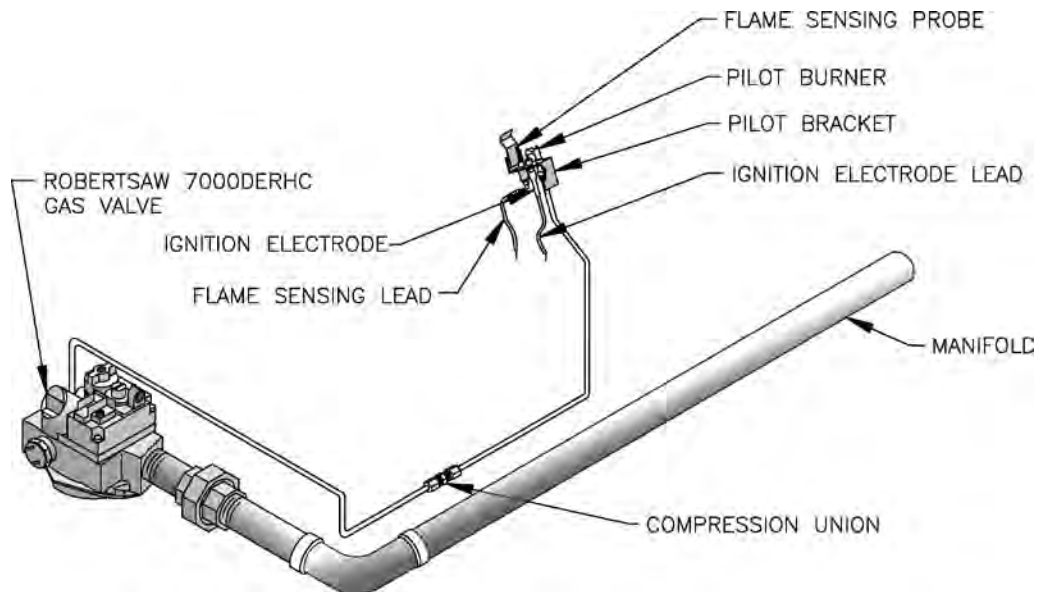


FIG. 29
PILOT PIPING - EI CONTROL SYSTEM (Robertshaw7000)
U.S.A. 5006B THRU 5009B

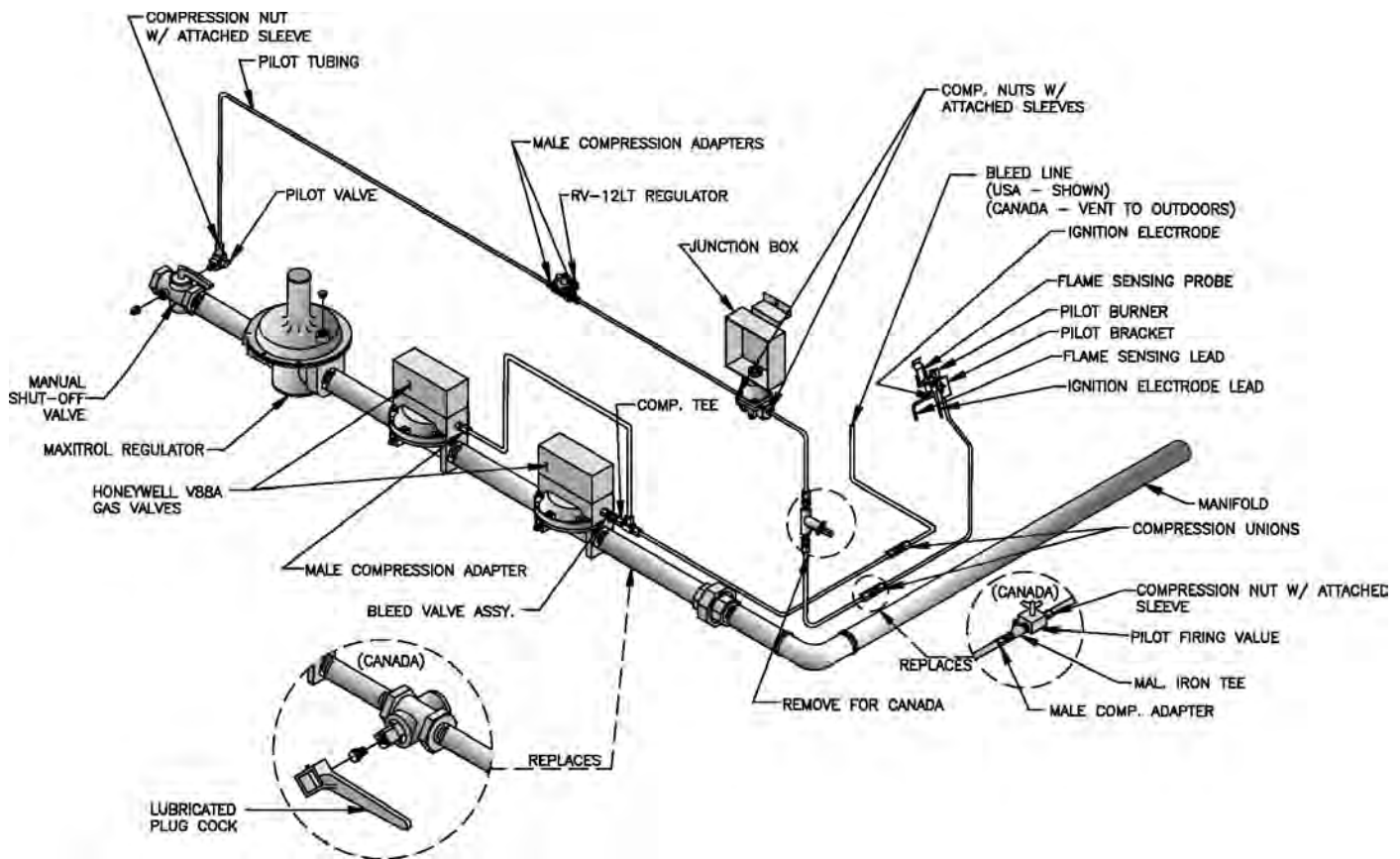


FIG. 30
PILOT PIPING - EI CONTROL SYSTEM (V88A)
U.S.A. 5010B THRU 5026B - NAT. GAS
CANADA - 5006B THRU 5026B - NAT. GAS

2. INSTALLATION OF BLEED PIPING (V88 Gas Train only) – Using 1/4" OD aluminum tubing, install a bleed line on both diaphragm gas valves, connect together, and, on USA boilers, run tubing to bleed line protruding from inside base, see Fig. 30. On boilers installed in Canada, run bleed line to outdoors.
3. INSTALLATION AND WIRING OF S8610M IGNITION CONTROL MODULE – Using two #10-32 x 2" MS, and nuts, install the S8610M module bracket on the manifold just to the right of the main burner with pilot, see Fig. 28. Using two #6 x 3/4" SMS, install the S8610M module on the bracket. Connect the two wires from the Q3481B pilot to the S8610M module as shown on Fig. 42, 43 or 44.
 - a. Ground Wire (200°C) to "BNR GND" terminal
 - b. Ignition Sensor Wire to "Spark" terminal
 Secure these wires to Pilot Piping with Wire Tie to provide strain relief.

Using wiring harness furnished, connect leads with push-on terminals on S8610M module as shown in Fig. 42, 43 or 44. Run harness outside of jacket on underside of manifold and secure in this position with Wire Ties furnished. Connect the six wires in the harness to the specified controls as shown in Fig. 42, 43 or 44.

4. COMPLETION OF WIRING – Connect power supply fused disconnect switch, service switch, primary side of transformer, gas valves and remaining controls – see Fig. 42, 43 or 44 for wire type and connections to be made. All wiring must be adequately supported and strain relief provided. All wiring including ground connections must comply with the requirements of the authority having jurisdiction and, in the absence of such, to the National Electrical Code, ANSI NFPA No. 70-2005, or the Canadian Electrical Code, C22.1, whichever is applicable.

EO Control System

1. INSTALLATION OF PILOT SAFETY SWITCH AND PILOT PIPING – Using two #10-32 x 2" MS and nuts, install the L62GB-3C pilot safety switch bracket on the manifold just to the right of the main burner with pilot. Install L62GB-3C pilot safety switch on bracket using

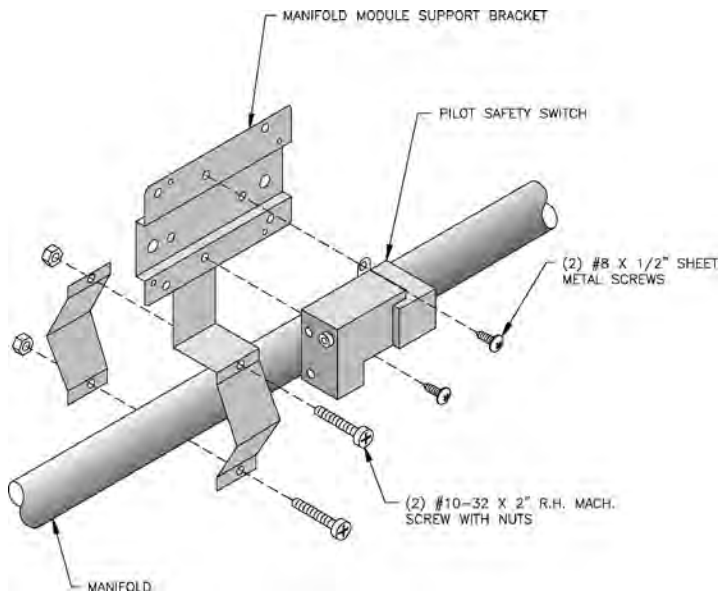


FIG. 31
INSTALLATION OF PILOT SAFETY SWITCH
EO CONTROL SYSTEM

three #8 x 1/2" SMS. "IN" on pilot safety switch should be pointed in the direction of the Gas Train to which the pilot safety switch is to be connected, see Fig. 31.

Using 1/4" OD Aluminum Tubing, connect the pilot valve installed in the manual shut-off valve in the gas train, to the inlet of the RV-12LT regulator (Packed in Gas Train Carton). Regulator should be above Gas Train and near front of boiler, see Fig. 32. Install 1/8" tee into outlet of regulator (USA boilers only) and, using 1/4" OD tubing, connect outlet of tee to "IN" connection on pilotstat, see Fig. 32. Connect the Q309 thermocouple to pilot safety switch. Using 1/4" OD aluminum tubing, connect the outlet of the pilotstat to the tubing or fittings connected to the pilot burner, see Fig. 32.

2. INSTALLATION OF BLEED PIPING – Using 1/4" OD aluminum tubing, install a bleed line on both diaphragm valves, connect together, see Fig. 25 or 26 and run tubing to bleed line protruding from inside base, see Fig. 32. On boiler installed in Canada, run bleed line to outdoors.
3. INSTALLATION OF "EO" PANEL AND WIRING OF PILOT AND PILOTSTAT – Attach the EO mounting bracket with Controls, see Fig. 33, to both Upper and Lower Jacket End Panels, preferably on the same end as the Gas Train. Two holes in each Jacket Panel have been provided for this purpose. Use two #10-32 x 1/2"

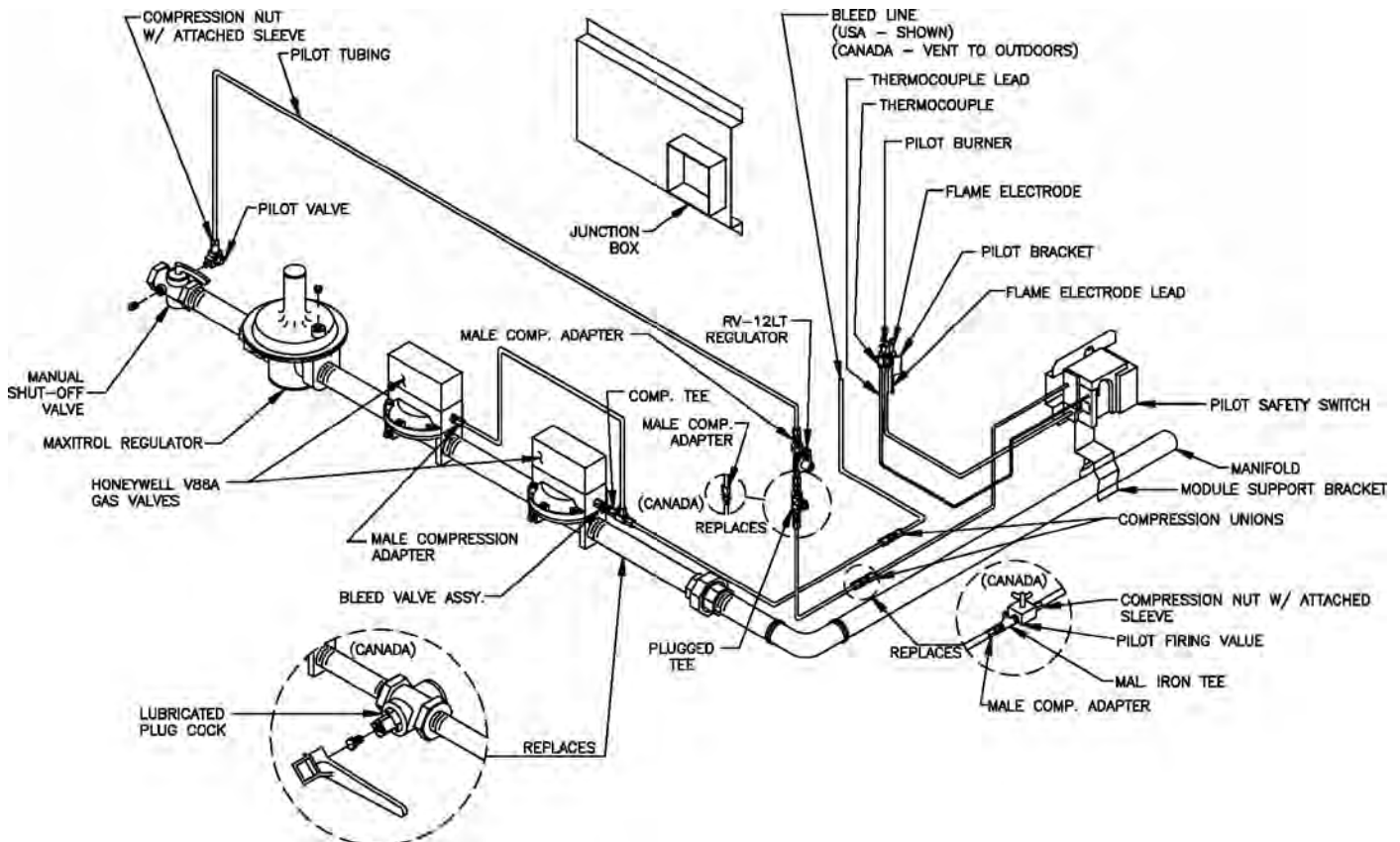


FIG. 32
PILOT PIPING
EO CONTROL SYSTEM

MS and nuts in the front holes and two #8 SMS in the rear holes.

Connect the two wires from the Q179D pilot to the RA890F Protectorelay Sub base as follows:

- a. Ground Wire (200°C) to the “G” terminal
- b. Flame detector wire (Honeywell 1298020) to “F” terminal
- c. Thermocouple Lead to L62 Pilotstat.

Wire the pilotstat to the gas valve transformer and to the V88A Gas Valves using the 105°C wire furnished, see Fig. 46 or 47. If Foot Mounted transformer, connect to J-box using straight connector, BX, straight connector and ½” pipe coupling. Drill holes in Jacket and fasten Transformer with SMS.

Run these wires to outside of jacket on underside of manifold and secure in this position with Wire Ties furnished to provide strain relief. Provide adequate support and strain relief for wiring outside jacket.

4. COMPLETION OF WIRING – Connect power supply fused disconnect switch, service switch, primary and secondary side of gas valve transformer, primary side of ignition transformer, and remaining controls – see Fig. 46 – 50 for wire type and connections to be made. All

wiring must be adequately supported and strain relief provided. All wiring including ground connections must comply with the requirements of the authority having jurisdiction and, in the absence of such, to the National Electrical Code, ANSI NFPA No. 70-2005, or the Canadian Electrical Code, C22.1, whichever is applicable.

EE Control System

1. INSTALLATION OF “EE PANEL”, - Attach the EE mounting bracket with Controls, see Fig. 33, to both Upper and Lower Jacket End Panels. Two holes in each Jacket Panel have been provided for this purpose. Use two #10-32 x ½” MS and nuts in the front holes and two #8 SMS in the rear holes. If Foot Mounted Transformer, connect to J-box using straight connector, BX, straight connector and ½” pipe nipple. Drill holes in Jacket and fasten Transformer using SMS.
2. INSTALLATION OF PILOT PIPING – Install the H91WA-4 pilot solenoid valve in the bottom center knockout of the J-box using conduit fittings furnished, see Fig. 34. Install RV-12LT regulator, (Packed in Gas Train Carton) and 1/8” tee in the ¼” OD pilot tubing as shown in Fig. 34.

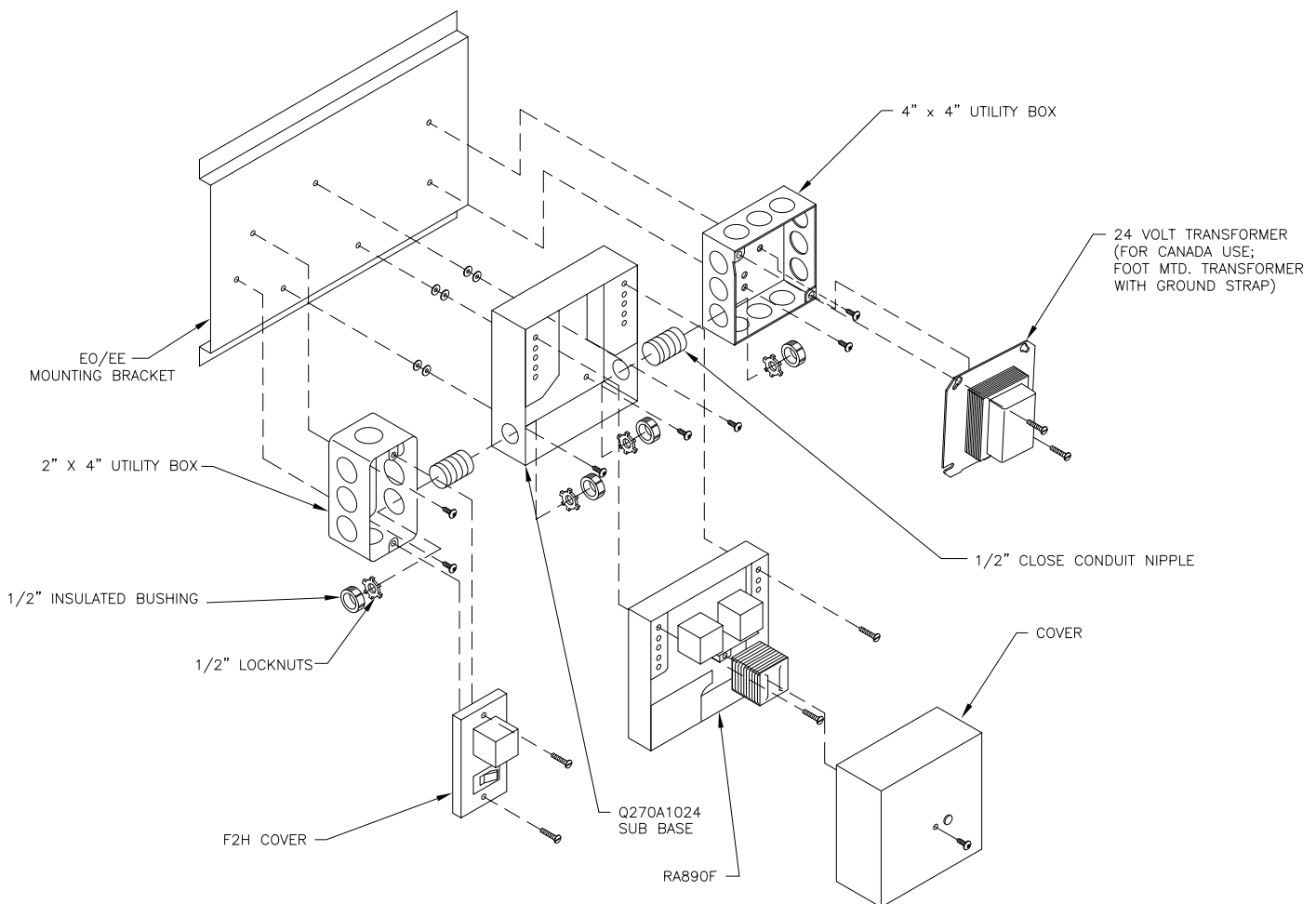


FIG. 33
INSTALLATION OF EO AND EE MOUNTING BRACKET AND CONTROLS

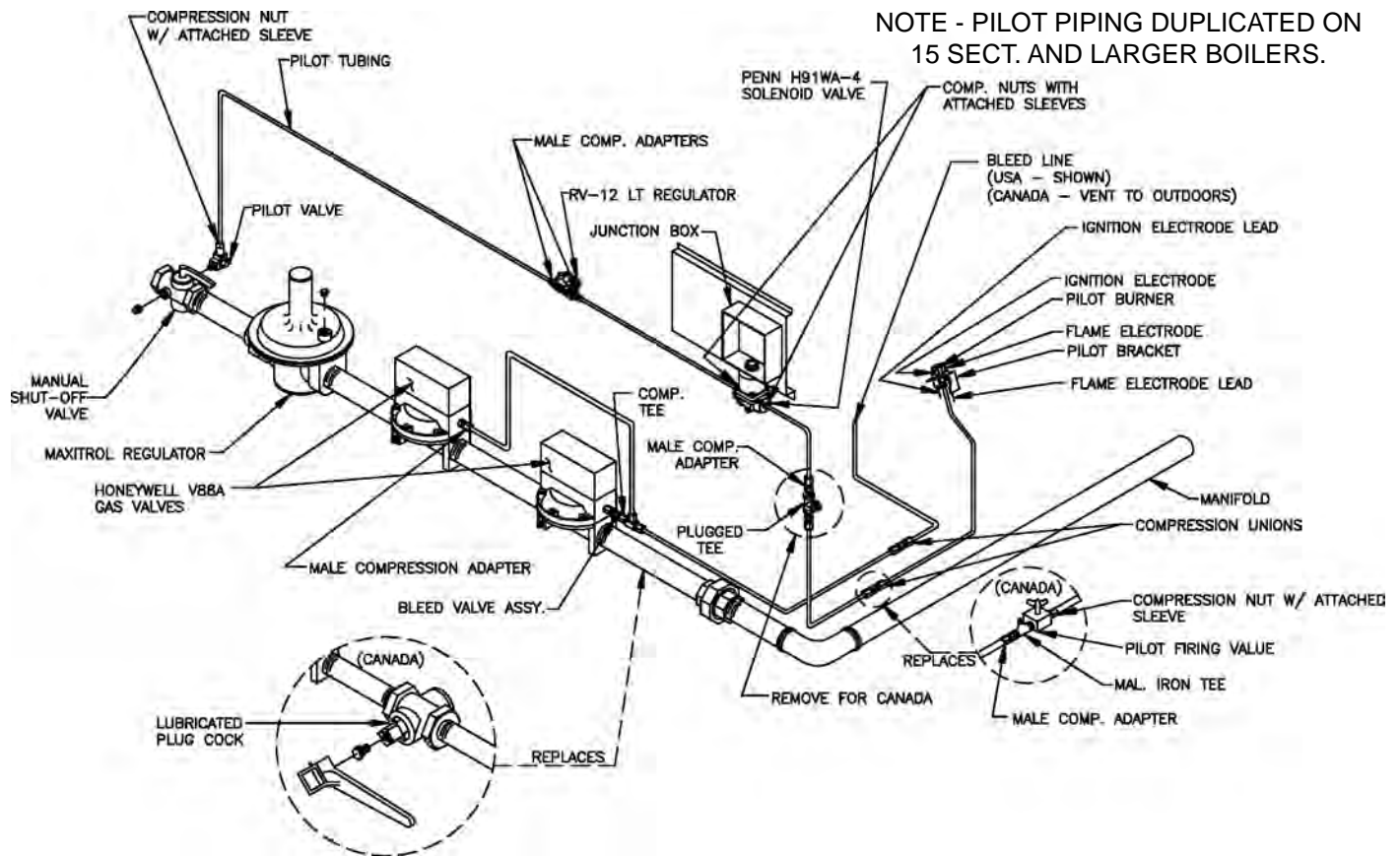


FIG. 34
PILOT PIPING
EE CONTROL SYSTEM

3. **INSTALLATION OF BLEED PIPING** – Using ¼" OD aluminum tubing, install a bleed line on both diaphragm valves, connect together, see Fig. 25 or 26, and, on USA boilers, run tubing to bleed line protruding from inside base, see Fig. 34. On boilers installed in Canada, run bleed line to outdoors.
4. **INSTALLATION OF IGNITION TRANSFORMER AND WIRING OF PILOT** – If space permits, mount the ignition transformer on the Jacket above the Gas Train using four #8 x ½" SMS. Holes will have to be drilled for this purpose. If space does not permit mounting the Ignition Transformer on the Jacket, install the Ignition Transformer on a nearby wall.

Connect the two wires from the Q179C pilot to the RA890F Protectorelay Sub base as follows:

- a. Ground Wire (200°C) to the "G" terminal
- b. Flame detector wire (Honeywell 1298020) to "F" terminal
- c. Ignition Cable (Honeywell 1061012) to the Secondary (High Voltage) terminal of the Ignition Transformer

Run these wires to outside of jacket on underside of manifold and secure in this position with Wire Ties furnished to provide strain relief. Provide adequate support and strain relief for wiring outside jacket.

5. **COMPLETION OF WIRING** – Connect power supply fused disconnect switch, service switch, primary and secondary side of gas valve transformer, primary side of ignition transformer, and remaining controls – see Fig. 48 & 50 for wire type and connections to be made. All wiring must be adequately supported and strain relief provided. All wiring including ground connections must comply with the requirements of the authority having jurisdiction and, in the absence of such, to the National Electrical Code, ANSI NFPA No. 70-2005, or the Canadian Electrical Code, C22.1, whichever is applicable.

EOP Control System

1. **INSTALLATION OF "EOP PANEL" AND WIRING OF PILOT AND PILOT SAFETY SWITCH** – Mount the Electronic Control Panel on a wall adjacent to the Gas Train. Connect the two wires from the Q179D pilot to the Terminal Strip in the Electronic Control Panel as follows:
 - a. Ground Wire (200°C) to the #12 terminal
 - b. Flame detector wire (Honeywell 1298020) to #11 terminal
 - c. Thermocouple Lead to L62 Pilotstat.

Attach the bracket for mounting of the junction box to the lower front corner of the Jacket Upper End Panel using two #10-32 x ½" MS and nuts. Mount junction box to bracket using #8 SMS, see Fig. 25 and 26.

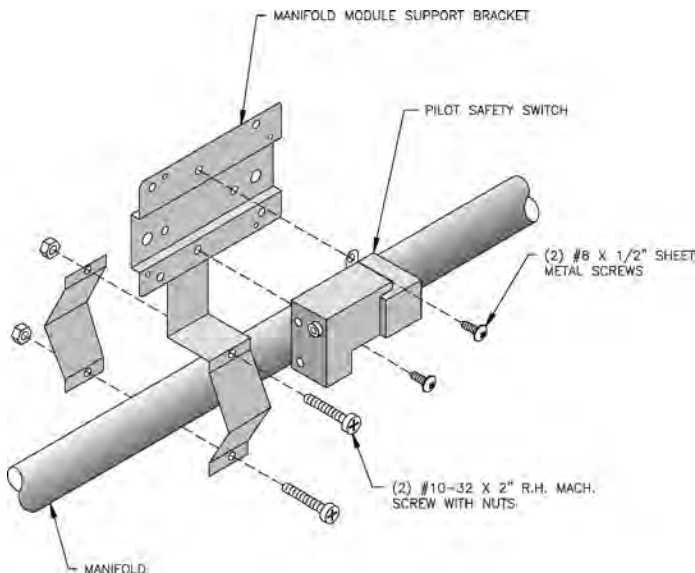


FIG. 35
INSTALLATION OF PILOT SAFETY SWITCH
EOP CONTROL SYSTEM

Install AT72D Transformer on J-box.

Wire L62G13-3C Pilot Safety Switch to the 24V/40VA transformer and to the V88A Gas Valves using the 105°C wire furnished, see Fig. 51 or 52. Run these wires to outside of jacket on underside of manifold and secure in this position with Wire Ties furnished to provide strain relief. Provide adequate support and strain relief for wiring outside jacket.

2. INSTALLATION OF PILOT PIPING – Attach the bracket for mounting of the J-box to the lower front corner of the Upper Jacket End Panel using two #10-32

x 1/2" MS and nuts. Mount junction box to bracket using #8 SMS. Install RV-12LT Regulator, (Packed in Gas Train Carton) and 1/8" tee in the 1/4" OD pilot tubing as shown in Fig. 36. Install 24V/40VA Transformer on J-box.

3. INSTALLATION OF PILOT SAFETY SWITCH AND PILOT PIPING – Using two #10-32 x 2" MS and nuts, install the L62GB-3C pilot safety switch bracket on the manifold just to the right of the main burner with pilot. Install L62GB-3C pilot safety switch on bracket using two #10-32 x 1/2" MS. "IN" on pilot safety switch should be pointed in the direction of the Gas Train to which the pilot safety switch is to be connected, see Fig. 35.

Using 1/4" OD aluminum tubing, connect the pilot shutoff valve installed in the manual shutoff valve in the gas train, to the inlet of the RV-12LT regulator (packed in Gas Train Carton). Regulator should be above Gas Train and near front of boiler, see Fig. 36. Install 3/8" tee into outlet of regulator (USA boilers) and, using 1/4" OD aluminum tubing, connect outlet of tee to "IN" connection on pilot safety switch, see Fig. 36.

Using 1/4" OD aluminum tubing, connect the outlet of the pilot safety switch to the tubing or fitting connected to the pilot burner, see Fig. 36.

Connect Q309 thermocouple to pilot safety switch.

- a. Completion of Wiring -

Connect power supply fused disconnect switch service switch, primary and secondary of Gas Valve Transformer, gas valves, and other controls – see Fig. 51 or 52 for wiring type and connections to be

NOTE - PILOT PIPING DUPLICATED ON 15 SECT. AND LARGER BOILERS.

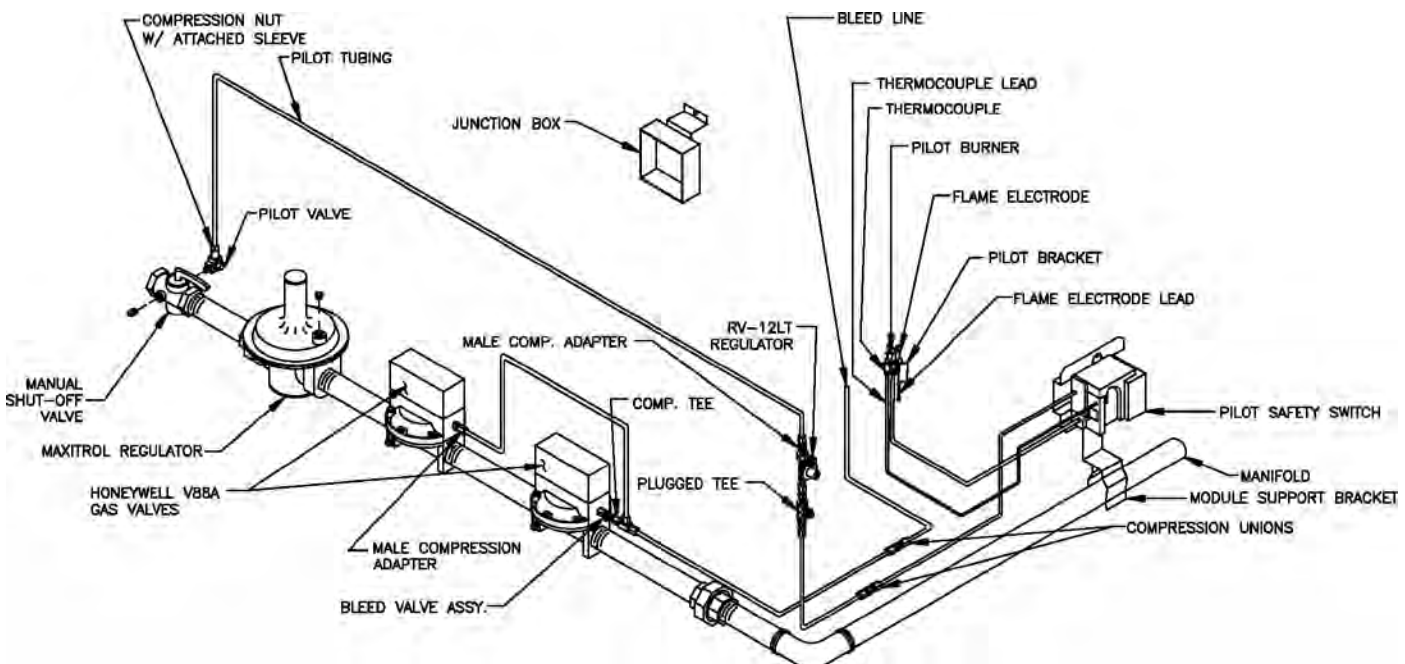


FIG. 36
PILOT PIPING
EOP CONTROL SYSTEM

made. All wiring must be adequately supported and strain relief provided.

All wiring including ground connections must comply with the requirements of the authority having jurisdiction and, in the absence of such to the National Electrical Code, ANSI NFPA No. 70-2005.

4. **INSTALLATION OF BLEED PIPING** – Using ¼" OD aluminum tubing, install a bleed line on both diaphragm valves, connect together, see Fig. 25 or 26, and run tubing to bleed line protruding from inside base, see Fig. 36.

EEP Control System

1. **INSTALLATION OF "EEP PANEL" IGNITION TRANSFORMER AND WIRING OF PILOT** – Mount the Electronic Control Panel and Ignition Transformer on a wall adjacent to the Gas Train. Connect the three wires from the Q179C pilot as follows:
 - a. Ground Wire (200°C) to #12 terminal of terminal strip in Electronic Control Panel.
 - b. Flame detector wire (Honeywell 1298020) to #11 terminal strip in Electronic Control Panel.
 - c. Ignition Cable (Honeywell 1061012) to the secondary (high voltage) terminal of the Ignition Transformer.
2. **INSTALLATION OF PILOT PIPING** – Install the H91WA-4pilot solenoid valve in the bottom center knockout of the J-box using conduit fittings furnished, see Fig. 34. Install RV-12LT regulator, (Packed in Gas Train Carton) and 1/8" tee in the ¼" OD pilot tubing as shown in Fig. 37.

3. **INSTALLATION OF BLEED PIPING** – Using ¼" OD aluminum tubing, install a bleed line on both diaphragm valves, connect together, see Fig. 25 or 26, and, on USA boilers, run tubing to bleed line protruding from inside base, see Fig. 37. On boilers installed in Canada, run bleed line to outdoors.

4. **INSTALLATION OF GAS VALVE TRANSFORMER AND COMPLETION OF WIRING** – Attach the bracket for mounting of the junction box to the lower front corner of the Jacket Upper End Panel using two #10-32 x ½" MS and nuts. Mount junction box to bracket using #8 SMS, see Fig. 25 or 26. Install Transformer on junction box.

a. Completion of Wiring -

Connect power supply fused disconnect switch service switch, primary and secondary of Gas Valve Transformer, gas valves, and other controls – see Fig. 53 or 54 for wiring type and connections to be made. All wiring must be adequately supported and strain relief provided.

All wiring including ground connections must comply with the requirements of the authority having jurisdiction and, in the absence of such to the National Electrical Code, ANSI NFPA No. 70-2005.

Thermocouple Control System

1. **INSTALLATION OF PILOT SAFETY SWITCH AND PILOT PIPING** - Using two #10-32 x 2" MS and nuts, install the L62GB-3C pilot safety switch bracket on the manifold just to the right of the main burner with pilot. Install L62GB-3C pilot

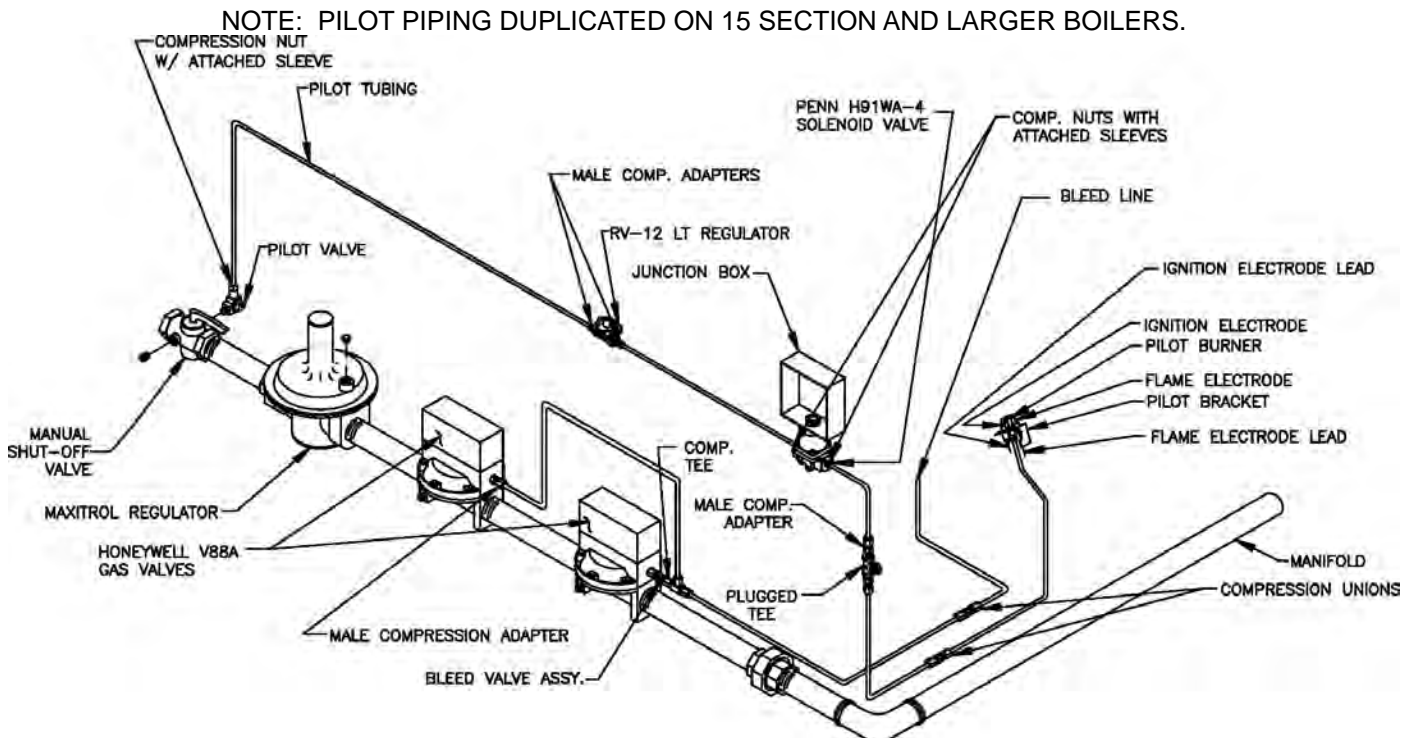
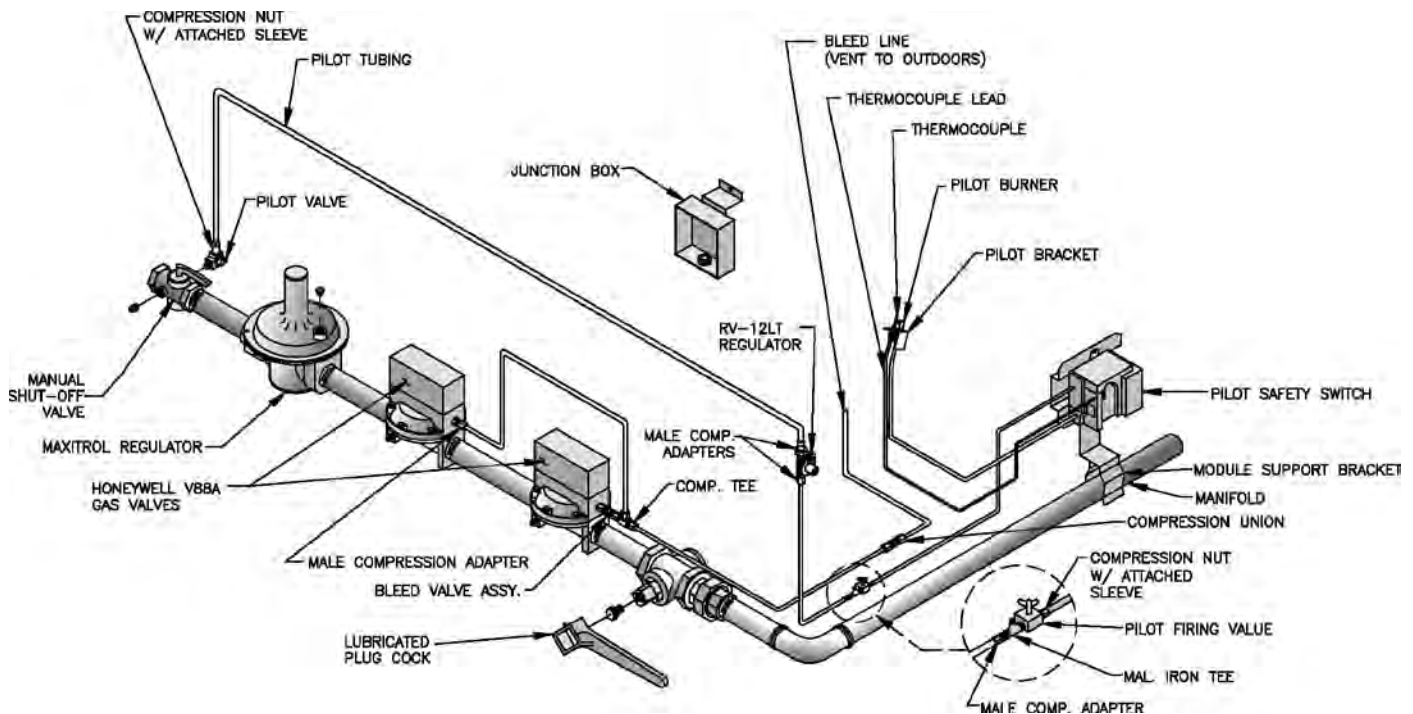


FIG. 37
PILOT PIPING
EEP CONTROL SYSTEM

**"THERMOCOUPLE CONTROL SYSTEM"
CANADA ONLY**



**FIG. 38
PILOT PIPING
THERMOCOUPLE CONTROL SYSTEM
CANADA ONLY**

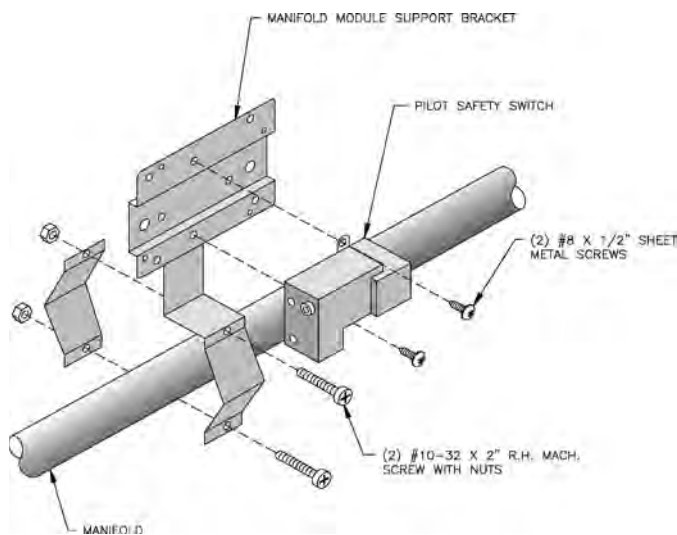


FIG. 39

**NOTE - TWO PILOT SAFETY SWITCHES REQUIRED
ON 15 SECT. AND LARGER BOILERS.
INSTALLATION OF PILOT SAFETY SWITCH
THERMOCOUPLE CONTROL SYSTEM**

safety switch on bracket using two #10-32 x 1/2" MS. "IN" on pilot safety switch should be pointed in the direction of the Gas Train to which the pilot safety switch is to be connected, see Figure 39.

Using 1/4" OD aluminum tubing, connect the pilot shutoff valve installed in the manual shutoff valve

in the gas train, to the inlet of the RV-12LT regulator (packed in Gas Train Carton). Regulator should be above Gas Train and near front of boiler, see Figure 38. Install 3/8" tee into outlet of regulator (USA boilers) and, using 1/4" OD aluminum tubing, connect outlet of tee to "IN" connection on pilot safety switch, see Figure 38.

Using 1/4" OD aluminum tubing, connect the outlet of the pilot safety switch to the tubing or fitting connected to the pilot burner, see Figure 38.

Connect Q309 thermocouple to pilot safety switch.

Connect power supply fused disconnect switch, service switch, primary and secondary of Gas Valve Transformer, gas valves, and other controls - see Figure 55 or 56 for wiring type and connections to be made. All wiring must be adequately supported and strain relief provided.

All wiring including ground connections must comply with the requirements of the authority having jurisdiction and, in the absence of such to the National Electrical Code, ANSI NFPA No. 70-2005.

2. **INSTALLATION OF GAS VALVE TRANSFORMER AND COMPLETION OF WIRING** - Attach the bracket for mounting of the junction box to the lower front corner of the Jacket

Upper End Panel using two #10-32 x 1/2" MS and nuts. Mount junction box to bracket using #8 SMS, see Figure 25 or 26. Install Transformer on junction box.

Venting

1. INSTALL VENT CONNECTOR from canopy Drafthood or damper to chimney maintaining 6" clearances from combustible materials.
2. INSTALL VENT SYSTEM – Typical vent systems are shown in Fig. 40 and 41. Some of the factors affecting vent sizing and construction accompany these figures.

Vent installation shall be in accordance with local building codes; or the local authority having jurisdiction; or the National Fuel Gas Code, ANSI Z223.1/NFPA 54; or the Standard for Chimneys, Fireplaces, Vents and Solid Fuel Burning Appliances, ANSI/NFPA 211. Both of the aforementioned standards, ANSI Z223.1 and ANSI/NFPA 211,

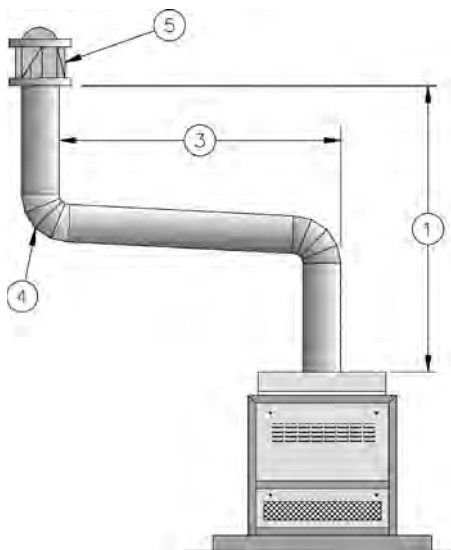


FIG. 40
SINGLE VENT SYSTEM

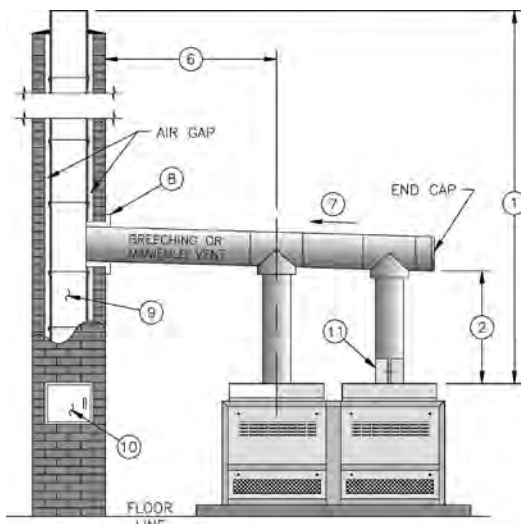


FIG. 41
MANIFOLD VENT SYSTEM

specify Type B and Type L double wall metal vents and fire clay tile lined masonry chimneys as suitable chimney constructions for Category I, draft hood equipped appliances, such as this Series 5B boiler. Both standards prohibit the use of unlined masonry construction as a chimney, with the exception in ANSI Z223.1/NFPA 54 that "Where permitted by the authority having jurisdiction, existing chimneys shall be permitted to have their use continued when an appliance is replaced by an appliance of similar type, input rating and efficiency." ANSI/NFPA 211 prohibits the use of single wall metal vent as a chimney, while ANSI Z223.1 allows it under very restrictive conditions.

In Canada, refer to CAN/CSA-B149.1 or .2-M86 and local codes for venting.

SOME ITEMS RELATIVE TO CONSTRUCTION AND SIZING OF VENT SYSTEM

- (1) Total Vent Height.
- (2) Vent Connector – make Initial Rise as high as possible.
- (3) Length of Lateral – hold to a minimum.
- (4) Number of Elbows – hold to a minimum.
- (5) UL Listed Vent Cap – assures full vent capacity and freedom from adverse wind effects.
- (6) Locate Boiler as close to Chimney as possible consistent with necessary clearances, see page 7.
- (7) Run Breeching Horizontal and slope upward to Chimney maximum of 1/4" per ft.
- (8) Use thimble where Breeching enters masonry chimney – keep breeching flush with inside of flue liner – do not connect into same leg of chimney serving an open fireplace.
- (9) Install vent above bottom of Chimney to prevent blockage – inspect chimney for obstructions or restrictions and remove – clean chimney if necessary.
- (10) Provide cleanout in chimney.
- (11) Slip joint or draw band – facilitates installation and future servicing when necessary.
- (12) Venting of other appliances into same chimney or into a common vent will affect sizing of the chimney or common vent.
- (13) Correction for altitude – design vent system for sea level input.
- (14) Provide adequate ventilation of Boiler Room, see page 7 – this cannot be overemphasized.
- (15) Never pass any portion of a vent system thru a circulating air duct or plenum.
- (16) Support of lateral runs so that vent pipe does not sag.
- (17) Support of common vent where it passes thru a ceiling or roof.
- (18) Clearances to combustible material – use of thimbles.
- (19) Firestops.

- (20) Flashing and storm collars.
- (21) Guying or bracing of common vent pipe above roof.
- (22) Securing and gas tightness of joints.
- (23) Lightning arrester if top of metal vent is one of highest points on the roof.

Where choice is possible, many advantages can be listed for the UL Listed double wall metal type B vent:

- 1. Warm up is faster with type B vents than vents having greater mass.

- 2. Type B vents permit closer clearance to combustible material than single wall metal vents unless special precautions are taken with the latter.
- 3. Type B vents are less prone to condensation and corrosion than single wall metal vents.
- 4. Type B vents are lightweight, easy to handle and assemble.

WARNING

WHEN AN EXISTING BOILER IS REMOVED FROM A COMMON VENTING SYSTEM, THE COMMON VENTING SYSTEM IS LIKELY TO BE TOO LARGE FOR PROPER VENTING OF THE APPLIANCES REMAINING CONNECTED TO IT. AT THE TIME OF REMOVAL OF AN EXISTING BOILER, THE FOLLOWING STEPS SHALL BE FOLLOWED WITH EACH APPLIANCE REMAINING CONNECTED TO THE COMMON VENTING SYSTEM PLACED IN OPERATION, WHILE THE OTHER APPLIANCES REMAINING CONNECTED TO THE COMMON VENTING SYSTEM ARE NOT IN OPERATION.

- A. SEAL ANY UNUSED OPENINGS IN THE COMMON VENTING SYSTEM.
- B. VISUALLY INSPECT THE VENTING SYSTEM FOR PROPER SIZE AND HORIZONTAL PITCH AND DETERMINE THERE IS NO BLOCKAGE OR RESTRICTION, LEAKAGE, CORROSION AND OTHER DEFICIENCIES WHICH COULD CAUSE AN UNSAFE CONDITION.
- C. INsofar as is practical, CLOSE ALL BUILDING DOORS AND WINDOWS AND ALL DOORS BETWEEN THE SPACE IN WHICH THE APPLIANCES REMAINING CONNECTED TO THE COMMON VENTING SYSTEM ARE LOCATED AND OTHER SPACES OF THE BUILDING. TURN ON CLOTHES DRYER AND ANY APPLIANCE NOT CONNECTED TO THE COMMON VENTING SYSTEM. TURN ON ANY EXHAUST FANS, SUCH AS RANGE HOODS AND BATHROOM EXHAUSTS, SO THEY WILL OPERATE AT MAXIMUM SPEED. DO NOT OPERATE A SUMMER EXHAUST FAN. CLOSE FIREPLACE DAMPERS.
- D. PLACE IN OPERATION THE APPLIANCE BEING INSPECTED. FOLLOW THE LIGHTING INSTRUCTIONS. ADJUST THERMOSTAT SO APPLIANCE WILL OPERATE CONTINUOUSLY.
- E. TEST FOR SPILLAGE AT THE DRAFT HOOD RELIEF OPENING AFTER 5 MINUTES OF MAIN BURNER OPERATION. USE THE FLAME OF A MATCH OR CANDLE, OR SMOKE FROM A CIGARETTE, CIGAR OR PIPE.
- F. AFTER IT HAS BEEN DETERMINED THAT EACH APPLIANCE REMAINING CONNECTED TO THE COMMON VENTING SYSTEM PROPERLY VENTS WHEN TESTED AS OUTLINED ABOVE, RETURN DOORS, WINDOWS, EXHAUST FANS, FIREPLACE DAMPERS AND OTHER GAS BURNING APPLIANCE TO THEIR PREVIOUS CONDITIONS OF USE.
- G. ANY IMPROPER OPERATION OF THE COMMON VENTING SYSTEM SHOULD BE CORRECTED SO THE INSTALLATION CONFORMS WITH THE NATIONAL FUEL GAS CODE, ANSI Z223.1. WHEN RESIZING ANY PORTION OF THE COMMON VENTING SYSTEM, THE COMMON VENTING SYSTEM SHOULD BE RESIZED TO APPROACH THE MINIMUM SIZE AS DETERMINED USING THE APPROPRIATE TABLES IN CHAPTER 10 IN THE NATIONAL FUEL GAS CODE, ANSI Z223.1.

SECTION IV - OPERATION

Safe lighting and other performance criteria were met with the gas manifold and control assembly provided on the boiler when the boiler underwent tests specified in ANSI Z21.13.

1. GENERAL

- a. **INITIAL FILL** – Before putting water into a new boiler, make certain that the firing equipment is in operating condition to the extent that this is possible, without actually firing into an empty boiler. This is necessary because raw water must be boiled [or heated to at least 180°F] promptly after it is introduced into the boiler in order to drive off the dissolved gases which might otherwise corrode the boiler.
- b. **PURGE GAS PIPING OF AIR** – Check Manual Shut Off Valve(s) and Pilot Shut Off Valve(s) at boiler to see that they are closed. Turn gas on at meter. Disconnect Pilot Tubing at Pilot Shut Off Valve(s), open Pilot Valve(s) until gas flows from valve(s) **KEEPING A CONSTANT CHECK DURING THE PURGING**. Close pilot valve(s) and reconnect the pilot tubing. (In Canada, refer to applicable Installation Codes for purging procedure.)
- c. **SINCE LIGHTING INSTRUCTIONS, SHUTDOWN INSTRUCTIONS, AND CONTROL SEQUENCE OF OPERATION VARY WITH GAS CONTROL SYSTEM INSTALLED, REFERENCE SHOULD NEXT BE MADE TO THE APPLICABLE CONTROL SYSTEM:**

EI Control System - Page 46
EO Control System - Page 52
EE Control System - Page 54
EOP Control System - Page 61
EEP Control System - Page 65
THERM Control System - Page 68

Check all electrical circuits and connections. Then follow lighting instructions up to a point where the boiler is ready to light.

2. BOILER AND SYSTEM CLEANING INSTRUCTIONS FOR TROUBLE FREE OPERATION

A qualified water treatment chemical specialist should be consulted for recommendations regarding appropriate chemical compounds and concentrations which are compatible with local environmental regulations.

A. Steam Boilers

1. Oil, greases & sediments which accumulate in a new boiler and piping must be removed in order to prevent an unsteady water line and carry over of the water into the supply main above boiler. Operate the boiler with steam in the entire system for a few days allowing the condensate to return

to the boiler. If the condensate can temporarily be wasted, operate boiler only for the length of time it takes for condensate to run clear. If the latter cannot be achieved or if the condensate is returned to the boiler, boil out the boiler using the surface blowoff connection. See Fig. 7.

- a. Drain boiler until water is just visible in gauge glass. Run temporary 1½" pipe line from the surface blowoff connection to an open drain or some other location where hot water may be discharged safely. Do not install valve in this line.
 - b. Add an appropriate amount of recommended boil out compound.
 - c. Start burner and operate sufficiently to boil the water without producing steam pressure. Boil for about 5 hours. Open boiler feed pipe sufficiently to permit a steady trickle of water from the surface blowoff pipe. Continue this slow boiling and trickle of overflow for several hours until the water coming from the overflow is clear.
 - d. Stop burner and drain boiler in a manner and to a location that hot water can be discharged with safety.
 - e. Refill boiler to normal water line. If water in gauge glass does not appear to be clear, repeat steps (a. through c.) and boil out the boiler for a longer time.
2. Low pressure steam boilers such as the 5B series should be maintained with appropriate water treatment compounds. Add suitable water treatment compounds as recommended by your qualified water treatment company.
 3. Remove temporary surface blowoff piping, plug tapping and reinstall safety valve. Boil or bring water temperature to 180°F promptly in order to drive off the dissolved gases in the fresh water.
 4. If unsteady water line, foaming or priming persist, install gate valve in Hartford Loop and drain valves in return main and at boiler and proceed as follows:
 - a. Connect hoses from drain valves to floor drain. Close gate valve in Hartford Loop and open drain valve in return main. Fill boiler to normal water level, turn on burner and operate boiler at this water level for at least 30 minutes after the condensate begins to run hot, then turn off burner.

Close all radiator valves. Remove all supply main air valves and plug the openings in supply main.

- b. Draw about 5 gallons of hot water from boiler into a container and dissolve into it the appropriate amount of a recommended boilout compound. Remove safety valve from boiler and pour this solution into boiler, then reinstall safety valve.
- c. Turn on burner and keep operating while feeding water to boiler slowly. This will raise water level in boiler slowly into supply main and back through return main, flowing from drain hose at about 180°F. Continue until water runs clear from drain hose for at least 30 minutes.
- d. Stop feeding water to boiler but continue operating burner until excess water in boiler flows out through supply main and water lowers (by steaming) until it reaches normal level in boiler.
Turn off burner. Drain boiler. Open all radiator valves. Reinstall all supply main air valves. Open gate valve in Hartford Loop.
- e. When boiler has cooled down sufficiently (crown-sheet of sections are not too hot to touch), close the drain valves at boiler and in return main and feed water slowly up to normal level in boiler. Turn on burner and allow boiler to steam for 10 minutes, then turn off burner. Draw off one quart of water from bottom gauge glass fitting and discard. Draw off another quart sample and if this sample is not clear, repeat the cycle of draining the boiler and return main and refilling the boiler until sample is clear.
- f. If the boiler water becomes dirty again at a later date due to additional sediment loosened up in the piping, close gate valve in Hartford Loop, open drain valve in return main, turn on burner and allow condensate to flow to drain until it has run clear for at least 30 minutes while feeding water to boiler so as to maintain normal water level. Turn off burner, drain boiler, open gate valve in Hartford Loop, then repeat step 1 above.

B. Water Boilers

1. Filling of Boiler and System – General – In a hot water heating system, the boiler and entire system (other than the expansion tank) must be full of water for satisfactory operation. Water should be added to the system until the boiler pressure gauge registers normal system design operating pressure. To insure that the system is full, water should come out of all air vents when opened.
2. Boiling Out of Boiler and System. The oil and grease which accumulate in a new hot water boiler can be washed out in the following manner.
 - a. Remove safety relief valve using extreme care to avoid damaging it.
 - b. Add an appropriate amount of recommended boil out compound.

- c. Reinstall safety relief valve.
- d. Fill the entire system with water.
- e. Start firing the boiler.
- f. Circulate the water through the entire system.
- g. Vent the system, including the radiation.
- h. Allow boiler water to reach operating temperature, if possible.
- i. Continue to circulate the water for a few hours.
- j. Stop firing the boiler.
- k. Drain the system in a manner and to a location that hot water can be discharged with safety.
- l. Remove the plugs from all available returns and wash the water side of the boiler as thoroughly as possible, using a high-pressure water stream.
- m. Refill the system with fresh water.
- n. Add appropriate boiler water treatment compounds as recommended by your qualified water treatment company.

3. Make pH or Alkalinity Test

After boiler and system have been cleaned and refilled as previously described, test the pH of the water in the system. This can easily be done by drawing a small sample of boiler water and testing with Hydrion paper which is used in the same manner as litmus paper, except that it gives specific readings. A color chart on the side of the small hydrion dispenser gives the reading in pH. Hydrion paper is inexpensive and obtainable from any chemical supply house or through your local druggist. The pH should be higher than 7 but lower than 11. Add some washout chemicals (caustic soda), if necessary, to bring the pH within the specified range. With this lower level of protection, care must be exercised to eliminate all of the free oxygen in the system.

4. Boiler is now ready to be put into service.

TABLE IV: WATER CONTENT

Boiler Size	Water Content (Gallons)	
	Water Boiler	Steam Boiler
5006B	37.6	25.6
5007B	43.4	29.3
5008B	49.1	33.0
5009B	54.9	36.8
5010B	60.6	40.5
5011B	66.4	44.2
5012B	72.1	47.9
5013B	77.9	51.6
5014B	83.7	55.4
5015B	89.4	59.1
5016B	95.2	62.8
5017B	100.9	66.5
5018B	106.7	70.2
5019B	112.5	73.9
5020B	118.2	77.7
5021B	124.0	81.4
5022B	129.7	85.1
5024B	141.2	92.5
5026B	152.8	100.0

3. CONDENSATION

Following a cold start, condensation (sweating) may occur in a gas fired boiler to such an extent that it

appears that the boiler is leaking. This condensation can be expected to stop after the boiler is hot.

CONTROL VARIATIONS

NATURAL GAS

MODEL NO.	CONTROL SYSTEM	TYPE OF PILOT	GAS VALVES		OPTIONAL MAIN VALVES	REFERENCE PAGE
			PILOT	MAIN		
5006B-5009B (USA)	EI	Elec. Ign.	(1) 7000DERHC-S7C		(B)	47
5010B-5026B (USA) 5006B-5026B (CANADA)	EI	Elec. Ign.	(1) H91WG-6	(2) V88A	(B)**	48-50
5006B-5026B (USA & CANADA)	EO	Standing Q179D	(1) L62GB-3C	(2) V88A	(A), (B)	53 & 55
5008B-5026B (USA & CANADA)	EE	Elec. Ign. Q179C	(1) H91WA-4	(2) V88A	(A), (B)*	57 & 58
5006B-5026B (USA)	EOP	Standing Q179D	(1) L62GB-3C	(2) V88A	(A), (B)	60 & 62
5008B-5026B (USA)	EEP	Elec. Ign. Q179C	(1) H91WA-4	(2) V88A	(A), (B)*	64 & 67
5006B-5013B (CANADA)	24V	Standing	(1) L62GB-3C	(2) V88A	(A), (B)	69
5015B-5024B (CANADA)	24V	Standing	(1) 62GB-3C	(2) V88A	(A), (B)	70

LP GAS

MODEL NO.	CONTROL SYSTEM	TYPE OF PILOT	GAS VALVES		OPTIONAL MAIN VALVES	REFERENCE PAGE
			PILOT	MAIN		
5006B-5009B (USA)	EI	Elec. Ign.	(1) 7000DERHC-S7C			47
5006B-5026B (USA)	EO	Standing Q179D	(1) L62GB-3C	(2) V88A	(A)	53 & 55
5006B-5026B (CANADA)	EO	Standing Q179D	(1) L62GB-3C	(2) V88A	---	53 & 55
5006B-5026B (USA)	EOP	Standing Q179D	(1) L62GB-3C	(2) V88A	---	60 & 62

(A) -- (1) Honeywell V5055B Motorized Gas Valve with V4055A/V4062A/V9055A Actuator and (1) ITT K3A Solenoid Valve (120V)

(B) -- (1) Honeywell V8944B Combination Gas Valve and (1) ITT K3A Solenoid Valve (24V)

* -- To be used with (1) H91WA-4 Pilot Valve (120V)

** -- To be used with (1) H91WG-6 Pilot Valve (24V)

NOTE:

1. For Steam or Water
2. For 24V Thermostat Application - Wire RA89A Relay in Place of Operating Control Set Thermostat Heat Anticipator at 0.4 Amp. See Pages 47, 48 and 49.
3. All Battery Operated Thermostats **must** be Electrically Isolated From the Primary Circuit by an Isolating Relay.

4. EI CONTROL SYSTEM – The EI control system utilizes a solid state ignition control which lights the pilot burner by spark. Pilot gas is ignited and burns during each running cycle (intermittent electric pilot). Main burner and pilot gas are extinguished during the “off” cycle.

This system permits the main gas valves [Robertshaw7000 for 5006B thru 5009B, (2) V88A’s for 5010B thru 5014B] to open, and the pilot line gas valve to remain open, only when the Pilot Burner is proven to be lit.

Should a loss of flame occur, the main valve closes and the spark reoccurs within 0.8 second. The ignition module has an internal 100% lockout function to completely shutdown the system should the pilot gas fail to ignite within approximately 90 seconds. Five to six minutes after shutdown, the Ignition Module restarts the ignition sequence. The ignition trial, shutdown, and wait sequence continues until either the pilot lights or the Thermostat is set below room temperature (to end the call for heat). The ignition sequence can be reset by setting down the Thermostat for one minute.

a. OPERATING INSTRUCTIONS

- (1) Make sure all Manual Main Shut-off Valves and all Pilot Valves have been off for at least five minutes.
- (2) Set Operating and Limit Controls to desired settings.
- (3) Turn all Manual Main Shut-Off Valves and Pilot Valves to Open Position.
- (4) Turn on Main Electric Switch and Service Switch – Pilot(s) will automatically light main burners.

b. NORMAL OPERATION SEQUENCE

5006B thru 5009B, see Fig. 42

5010B thru 5014B, see Fig. 43

5015B thru 5026B, see Fig. 44

c. SHUT DOWN INSTRUCTIONS

- (1) Close manual shut-off valves and pilot valves.
- (2) Turn off main electric switch.

d. SAFETY SHUTDOWN

- (1) Safety Switch Circuit

If limit control, low water cut-off or any other electrical safety switch opens, power to the 24V terminal of all S8610M Ignition Controls is interrupted thus de-energizing terminals PV and MV. Loss of power to these terminals means loss of power to all pilot gas valves and to main

gas valves, respectively. Thus, pilot burner and main burner flames are extinguished.

Normal operation can be resumed when the cause of safety switch malfunction is corrected. Any controls with Manual Reset must be reactivated.

(2) Pilot Failure

Pilot failure can occur during the start-up or during the operating cycle of the boiler. Any failure of a Q3481B pilot will close the main gas valves controlled by this pilot within 0.8 second. For 90 seconds after pilot failure, the Ignition Control will try to reestablish pilot flame. If the pilot flame cannot be sensed by the sensing probe, the module will lock out on safety. Five to six minutes after shutdown, the IGNITION MODULE restarts the ignition sequence. The ignition trial, shutdown, and wait sequence continues until either the pilot lights or the Thermostat is set below room temperature (to end the call for heat). The ignition sequence can be reset by setting down the Thermostat for one minute.

On 15 section and larger boilers, where two manifolds, gas trains and pilot systems are employed, failure of one pilot will not affect operation of the other system. Thus, it is possible to fire the boiler at a reduced rate thru one manifold while the other is inoperative.

Pilot failure is caused by one of the following:

- (a) Pilot burns yellow resulting in weak signal from sensor to Ignition Control – may be due to dirt or lint that has covered the lower portion of the pilot burner – remove with a soft brush or by vacuuming.
- (b) Loss of pilot gas – may be due to faulty pilot solenoid valve, improper wiring, loose connections, or low voltage.
- (c) Loss of signal from sensing probe – may be faulty probe, improper or loose electrical connection, or faulty Ignition Control.

CAUTION

Be sure power is off when checking high voltage connections.

For S8610M Trouble Shooting Guide, see Page 51.

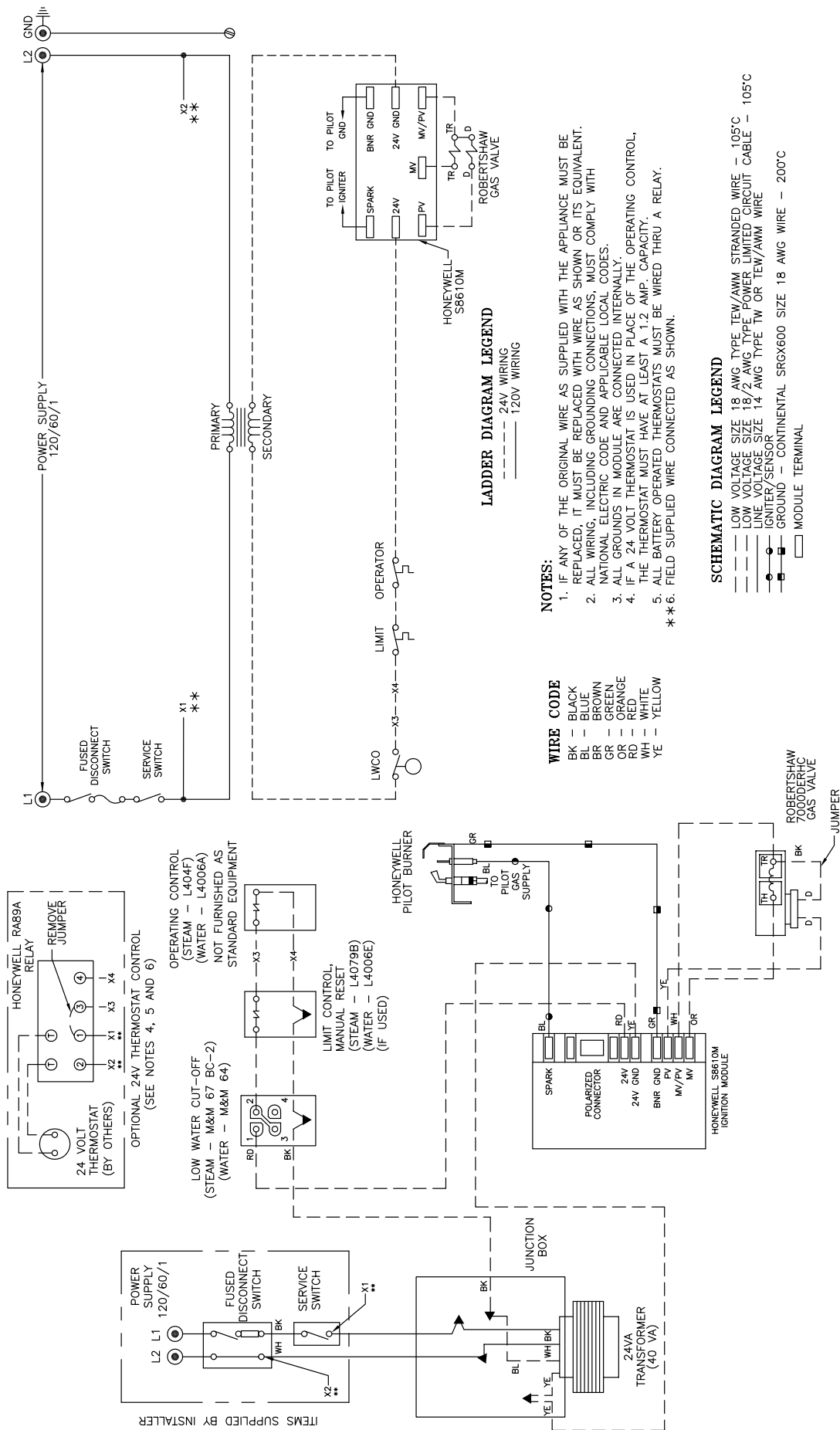


FIG. 42
SCHEMATIC WIRING DIAGRAM - EI CONTROL SYSTEM (ROBERTSHAW7000 GAS VALVE)
U.S.A. 5006B THRU 5009B

SEQUENCE OF OPERATION

WHEN OPERATING CONTROL CLOSES, THE ELECTRIC SPARK AND PILOT VALVE ARE AUTOMATICALLY ENERGIZED. THE SENSING PROBE PROVES THE PRESENCE OF THE PILOT FLAME. INTERNAL SWITCH ACTION DE-ENERGIZES THE SPARK AND ENERGIZES THE MAIN GAS VALVES STARTING MAIN BURNER OPERATION. WHEN THE OPERATING CONTROL IS SATISFIED THE PILOT GAS VALVE AND THE MAIN GAS VALVES ARE DE-ENERGIZED STOPPING THE BURNER OPERATION.

IN THE EVENT OF EXCESSIVE STEAM PRESSURE (STEAM BOILER) OR EXCESSIVE BOILER WATER TEMPERATURE (WATER BOILER), THE HIGH LIMIT CONTROL WILL DE-ENERGIZE THE PILOT GAS VALVE AND THE MAIN GAS VALVES STOPPING BURNER OPERATION.

THE LOW WATER CUT-OFF WILL ALSO STOP BURNER OPERATION IF THE WATER LEVEL IN THE BOILER SHOULD DROP BELOW THE LOWEST SAFE LEVEL.

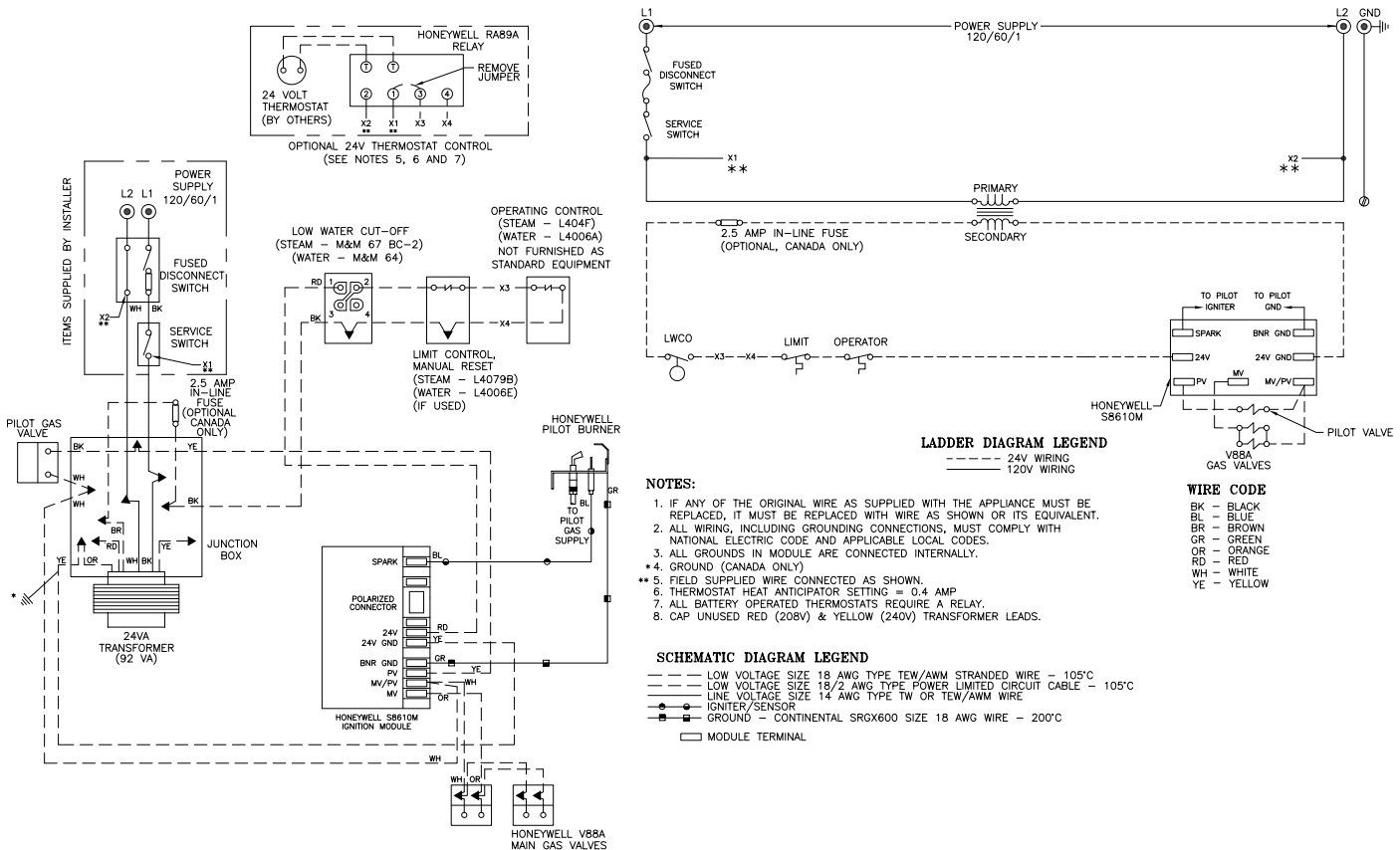


FIG. 43
SCHEMATIC WIRING DIAGRAM - EI CONTROL SYSTEM (V88 GAS TRAIN)
U.S.A. 5010B THRU 5014B
CANADA 5006B THRU 5014B

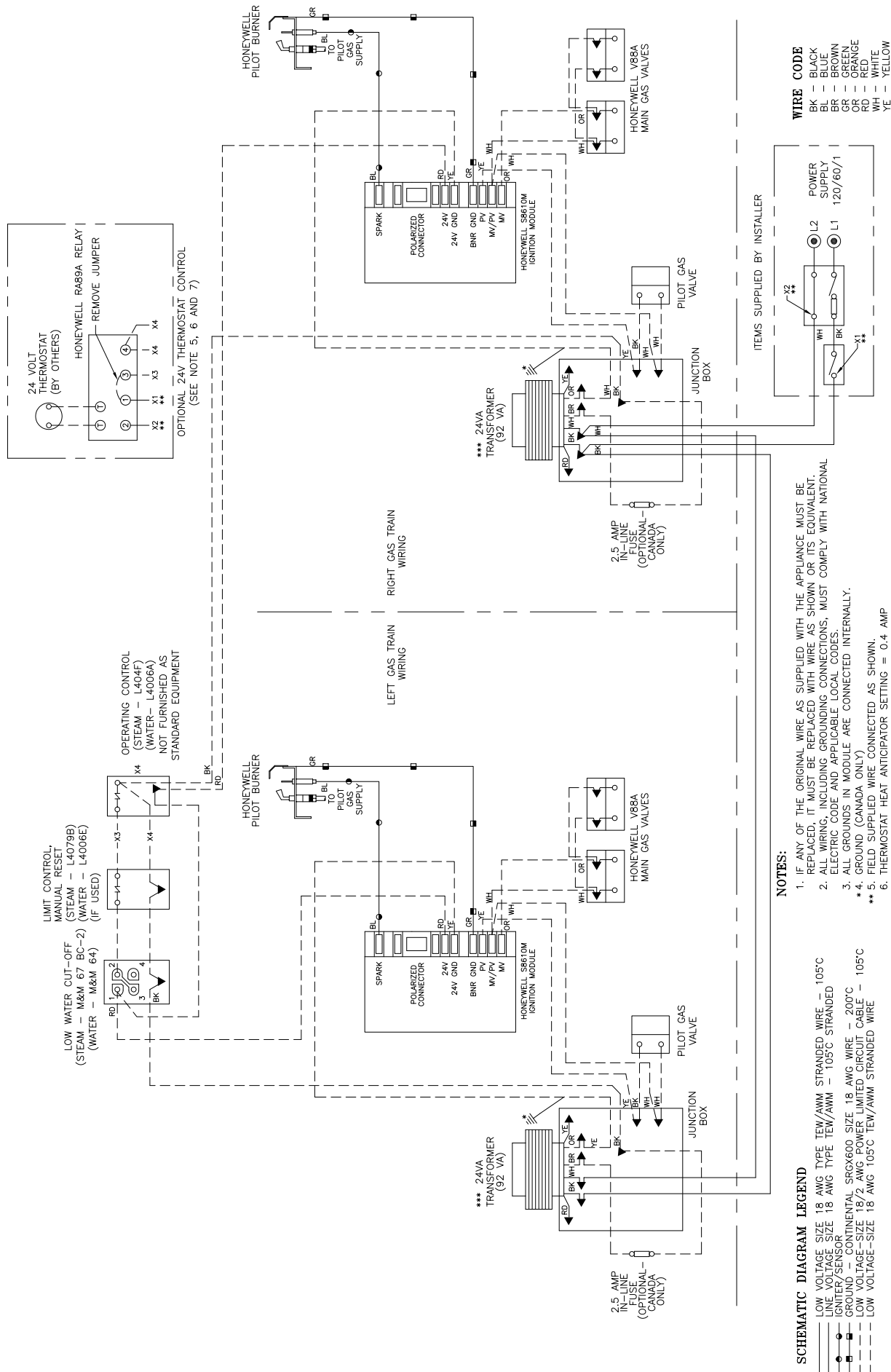


FIG. 44
SCHEMATIC WIRING DIAGRAM - 15 THRU 26 SECT. BOILERS
EI CONTROL SYSTEM

SEQUENCE OF OPERATION

WHEN OPERATING CONTROL CLOSES, THE ELECTRIC SPARK AND PILOT VALVE ON EACH SIDE ARE AUTOMATICALLY ENERGIZED. THE SENSING PROBE ON EACH OF THE PILOTS PROVES THE PRESENCE OF THE PILOT FLAME. INTERNAL SWITCH ACTION IN EACH IGNITION MODULE DE-ENERGIZES THE SPARK AND ENERGIZES THE MAIN GAS VALVES FOR ITS RESPECTIVE GAS TRAIN, STARTING MAIN BURNER OPERATION. WHEN THE OPERATING CONTROL IS SATISFIED THE PILOT GAS VALVE AND MAIN GAS VALVES FOR EACH GAS TRAIN ARE DE-ENERGIZED STOPPING BURNER OPERATION.

IN THE EVENT OF EXCESSIVE STEAM PRESSURE (STEAM BOILER) OR EXCESSIVE WATER TEMPERATURE (WATER BOILER) THE HIGH LIMIT CONTROL WILL DE-ENERGIZE THE PILOT VALVES AND MAIN GAS VALVES ON BOTH SIDES STOPPING BURNER OPERATION.

THE LOW WATER CUT-OFF WILL ALSO STOP BURNER OPERATION IF THE WATER LEVEL IN THE BOILER SHOULD DROP BELOW THE LOWEST SAFE LEVEL.

SHOULD ONE OF THE PILOT FLAMES FAIL TO IGNITE OR BECOME EXTINGUISHED, THE MAIN GAS VALVES CONTROLLED BY THAT PARTICULAR PILOT WOULD CLOSE STOPPING BURNER OPERATION ON THE BURNERS SUPPLIED BY THAT GAS TRAIN. OPERATION OF THE BURNERS SUPPLIED BY THE SECOND GAS TRAIN WOULD BE UNAFFECTED.

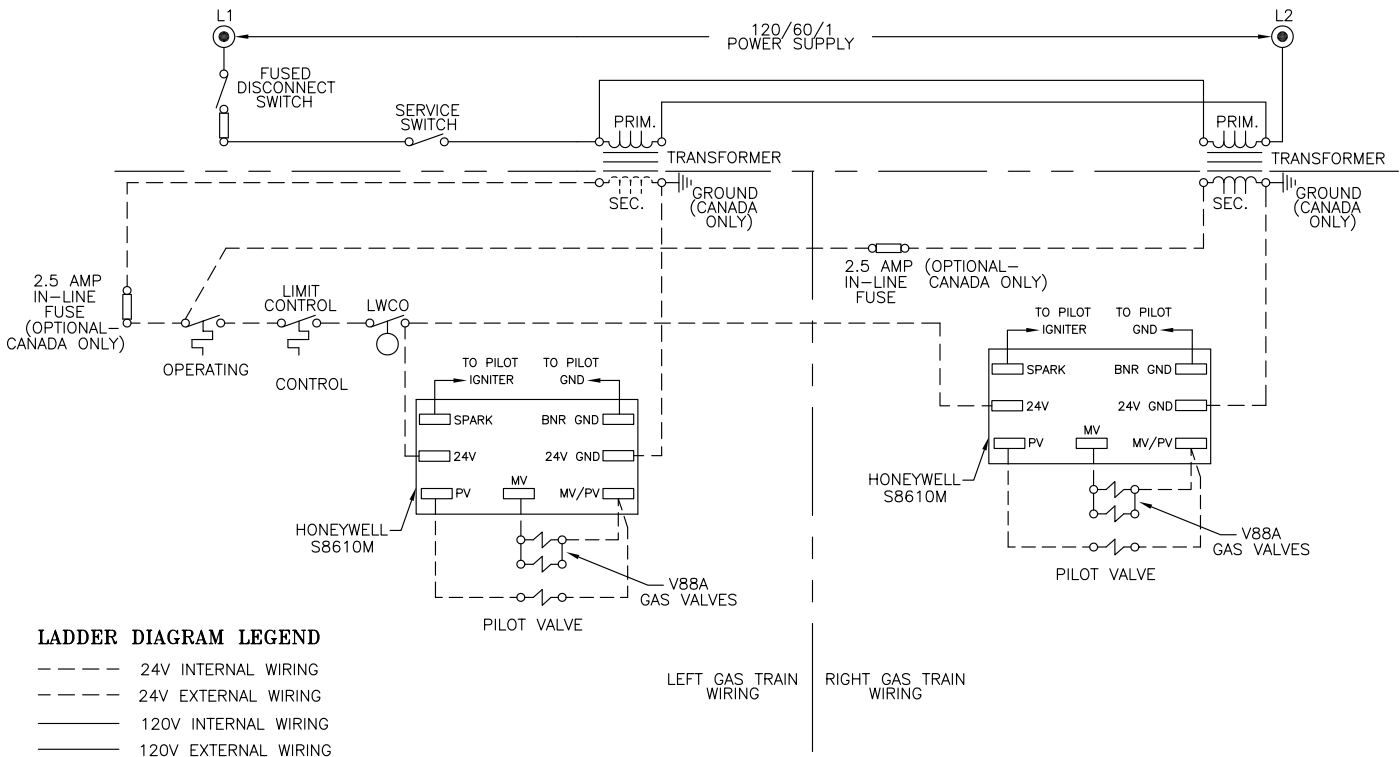
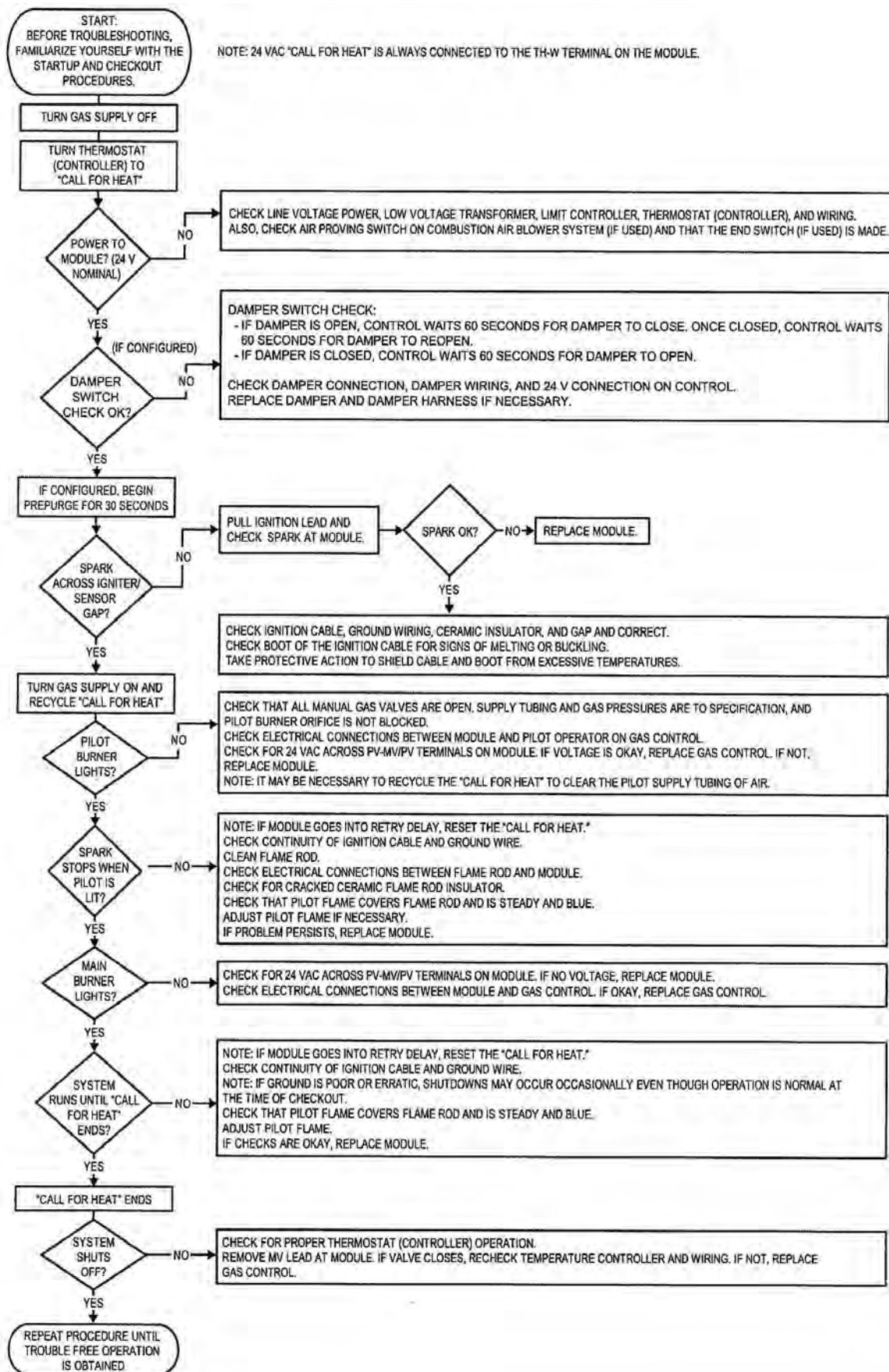


FIG. 45
LADDER WIRING DIAGRAM - 15 THRU 26 SECT. BOILERS
EI CONTROL SYSTEM

TROUBLE SHOOTING GUIDE

BOILERS EQUIPPED WITH S8610M INTERMITTENT ELECTRIC IGNITION



5. EO CONTROL SYSTEM – 5006B thru 5014B

The EO Control System utilizes an RA890F Protectorelay and a Q179D Rectification Pilot (standing or continuous burning pilot) to which has been added a Q309 thermocouple. The RA890F Protectorelay Primary Control is a non-programming, amplifying relay which, when used with the Q179D Pilot, provides solid state electric Flame Safeguard Protection during a “call for heat” pilot failure. Main burners will shut down within 0.8 second and the Protectorelay will lock out on safety shutdown within 15 seconds. Should a pilot failure occur during the “off” cycle, the thermocouple in the Q179D pilot will cool and, within 45 to 90 seconds, will cause the L62GB-3C Pilot Safety Switch to which it is connected, to break the electrical circuit to the main gas valves, as well as shut off the flow of gas to the pilot. Thus, 100% shut-off is achieved.

a. LIGHTING INSTRUCTIONS

- (1) Make sure Manual Main Shut-off Valve and Pilot Valve have been off for at least five minutes.
- (2) Set Operating and Limit Controls to desired setting.
- (3) Turn on Main Electric Switch and Service Switch.
- (4) Turn Pilot Valve to Open Position.
- (5) Depress button on L62GB-3C Pilot Safety Switch and hold lighted match to pilot, holding button in for one minute or until pilot remains lighted after button is released.
- (6) Press reset button on RA890F relay.
- (7) Open Manual Main Shut-off Valve – main burners will light.

Proceed to Paragraph 15- Minimum Input Adjustments (for diaphragm “Lo-Hi-Lo” or motorized type gas valves)

SEQUENCE OF OPERATION EO – see Fig. 46

b. NORMAL OPERATION – 5006B thru 5014B

- (1) When the operating control calls for heat, terminal #6 of RA890 Relay is energized.
- (2) A component check circuit in the RA890 Relay is activated which checks the electronic network of the relay.
- (3) Flame rod circuit of the RA890 and Q179D proves presence of pilot flame electronically.
- (4) Terminal #5 is energized and supplies power to the main gas valves.
- (5) Main gas valves open and main burners are lighted by pilot.
- (6) When operating control is satisfied, terminals #6 and #5 are de-energized, Main Gas Valves close and main burners are extinguished.
- (7) The pilot continues to burn.

c. SAFETY SHUTDOWN

(1) SAFETY SWITCH CIRCUIT

If limit control, Low Water Cut-off or any other electrical safety switch opens, power to terminal #6 in Relay is interrupted thus de-energizing terminal #5 in Relay. Main Gas Valves are thus de-energized and main gas burners are immediately extinguished. The pilot will continue to burn. Normal operation can be resumed when the cause of safety switch malfunction is corrected. Make sure all manual resets are activated where involved.

(2) PILOT FAILURE

- (a) Flame rod supervision of pilot occurs only during the operating cycle (call for heat) of the operating control since the RA890 relay is only energized by the operating control. If failure occurs during this period, the main gas valves close and the main gas burners are extinguished within 0.8 second. After 15 seconds the relay will lock out on safety shutdown.
- (b) If the pilot failure occurs during the “off” cycle of the operating control, the RA890 relay will not be powered thru terminal #6, therefore, there is no electronic flame rod supervision. This is due to the utilization of a thermocouple in the Q179D modified pilot. This thermocouple will cool in 45 to 90 seconds allowing the pilot line safety valve to close. This shuts off the flow of gas to the pilot. It is in this manner that 100% shut-off is achieved. If the operating control calls for heat during this period the RA890 relay will immediately sense “no flame” on pilot and will lockout as described in paragraph (a) above.

d. SHUTDOWN INSTRUCTIONS

- (1) Close manual shut-off valve and pilot valve.
- (2) Turn off main electric switch.

6. EO CONTROL SYSTEM 5015B thru 5026B

The 5015B thru 5026B boilers utilize two EO Control Systems that are interconnected electrically thru all operating and safety controls. Should any of the aforementioned controls break the power supply circuit, both EO control systems would be de-energized. The succeeding paragraph describes the function and operation of each EO Control System. Should a pilot failure on one EO Control System occur, the other EO Control System would not be affected. Thus main burners on the unaffected side would ignite on a “call for heat” and would continue to operate until the operating control was satisfied.

The EO Control System utilizes an RA890F Protectorelay and a Q179D Rectification Pilot (standing or continuous burning pilot) to which has been added

to a Q309 Thermocouple. The RA890F Protectorelay Primary Control is a non-programming, amplifying relay which when used with the Q179D Pilot provides solid state electronic Flame Safeguard Protection during a “call for heat” pilot failure. Main burners will shut down within 0.8 second and the Protectorelay will lock out on safety shutdown within 15 seconds. Should a pilot failure occur during the “off” cycle, the thermocouple will cool and within 45 to 90 seconds, will cause the L62GB-3C Pilot Safety Switch to which it is connected, to break the electrical circuit to the main gas valves as well as shut off the flow of gas to the pilot. Thus 100% shut-off is achieved.

a. LIGHTING INSTRUCTIONS

- (1) Make sure all Manual Main Shut-off Valves and all Pilot Valves have been off for at least five minutes.
- (2) Set Operating and Limit Controls to desired settings.
- (3) Turn on Main Electric Switch and Service Switch.
- (4) Open pilot valve on one side of boiler. Depress button on L62GB-3C Pilot Safety Switch to which it is connected and light pilot with match. Continue to hold button in for one minute or until pilot remains lighted after button is released. Light pilot on opposite side of boiler using same procedure.
- (5) Press reset button on each RA890F relay.
- (6) Open Manual Main Shut-off Valves – main burners will light.

Proceed to Paragraph 15- Minimum Input Adjustments (for diaphragm “Lo-Hi-Lo” or motorized type gas valves)

SEQUENCE OF OPERATION EO – See Fig. 47

b. NORMAL OPERATION – 5015B thru 5026B

- (1) When the operating control calls for heat, terminal #6 of each RA890F Protectorelay is energized.
- (2) A component check circuit in each RA890 Protectorelay is activated which checks the electronic network of the relay.
- (3) Flame rod circuit between each Q179D pilot and terminal “F” on its respective RA890F proves presence of flame electronically at its Q179D pilot.
- (4) Terminal #6 on each RA890F is energized supplying power to its respective main gas valves.
- (5) Main gas valves open and main burners are ignited by the pilot flames.
- (6) When operating control is satisfied, terminals #6 and #5 on the RA890F relays are de-energized, main gas valves close and main burners are extinguished.

- (7) The Q179D pilots continue to burn.

c. SAFETY SHUTDOWN

(1) SAFETY SWITCH CIRCUIT

If limit control, low water cut-off or any other electrical safety switch opens, power to terminal #6 and all other terminals on both RA890F relays is interrupted. Main gas valves are thus de-energized and main gas burners are immediately extinguished. Standing pilot flames in the Q179D pilots will continue to burn.

(2) PILOT FAILURE

- (a) Flame rod supervision of the Q179D pilots occurs only during the operating cycle (call for heat) since it is during this period that the control is energizing the RA890F relays. If pilot failure occurs during this period on one of the Q179D pilots, the main gas valves controlled by that particular RA890F will close in 0.8 second. The RA890F will lock-out on safety within 15 seconds. The burners controlled by the other RA890F will continue to burn.
- (b) If pilot failure occurs on one of the Q179D pilots during the “off” cycle of the operating control, there will be no electronic flame rod supervision since neither RA890F relay is energized during the off cycle. This is due to the utilization of a thermocouple in each Q179D modified pilot which controls its own pilot safety switch. This thermocouple will cool in 45 to 90 seconds de-energizing the pilot safety switch which interrupts the circuit between terminal #5 and the gas valves and also shuts off the flow of gas to the pilot. Thus 100% shut-off is achieved. If the operating control calls for heat during this period the RA890F relay will immediately sense “no flame” on the pilot and the relay will lock out on safety within 15 seconds.

Assuming the pilot on the opposite side is burning, the gas valves on that side will open and main flame will be ignited on that side only.

7. EE CONTROL SYSTEM – 5006B thru 5014B

The EE Control System utilizes an RA890F Protectorelay and a Q179C Rectification Pilot, which in addition to a pilot burner and rectifying flame rod flame detector to prove pilot, includes an ignition electrode for spark ignition of the pilot. A Webster 612-6A7 Transformer supplies the high voltage spark potential. Once pilot flame is proven, ignition stops but pilot flame continues as long as there is a “call for heat” (intermittent electrically ignited pilot).

The RA890F Protectorelay Primary Control is a non-programming amplifying relay which when used with

the Q179C Pilot provides solid state electronic Flame Safeguard Protection that will not allow the main gas valves to open on "call for heat" for that will shut down main burners within 0.8 second if pilot flame is not "proved". Protectorelay will lockout on safety shutdown within 15 seconds if there is a pilot flame failure on start or, if during the "run" cycle, pilot flame is not re-established. Since #3 terminal in the Protectorelay is de-energized at end of safety switch timing, a solenoid valve in the pilot line will close and thus 100% shut-off is achieved.

a. OPERATING INSTRUCTIONS

- (1) Make sure Manual Main Shut-off Valve and all Pilot Valve have been off for at least five minutes.
- (2) Set Operating and Limit Controls to desired settings.
- (3) Turn Manual Main Shut-off Valve and Pilot Valve to Open Position.
- (4) Turn on Main Electric Switch and Service Switch – Pilot will automatically light main burners.

SEQUENCE OF OPERATION EE - See Fig. 48

b. NORMAL OPERATION - 5006B thru 5014B

- (1) When the operating control calls for heat, terminal #6 of RA890 Relay is energized.
- (2) A component check circuit in the RA890 Relay is activated which checks the electronic network in the relay.
- (3) Terminals #3 and #4 of the relay are energized. Terminal #3 opens pilot line solenoid valve supplying gas to pilot. Terminal #4 energizes ignition transformer creating electric spark ignition at pilot.
- (4) Flame rod circuit between Q179C pilot and RA890 proves presence of pilot flame electronically.
- (5) Terminal #4 to ignition transformer is de-energized.
- (6) Terminal #5 is energized and supplies power to the main gas valves.
- (7) Main gas valves open and main burners are lighted by pilot.
- (8) When operating control is satisfied, terminals #6 and #5 are de-energized. Main Gas Valves and pilot line solenoid valve are all de-energized and main burner and pilot burner flames are extinguished.

c. SAFETY SHUTDOWN

(1) SAFETY SWITCH CIRCUIT

If limit control, low water cut-off or any other electrical safety switch opens, power to terminal #6 in relay is interrupted thus de-energized terminal #5 and #3 in relay which de-energizes main gas valves and pilot valves. Main gas

burners and pilot burners are immediately extinguished. Normal operation can be resumed when the cause of safety switch malfunction is corrected. Make sure all manual resets are activated where involved.

(2) PILOT FAILURE

- (a) Pilot failure can occur during the start of operating cycle of the boiler. Any pilot failure, on the Q179C electronic pilot, after ignition of pilot flame will close the main gas valves in 0.8 second.
- (b) For 15 seconds after failure of the Q179 pilot, the relay through terminals #3 and #4 will try to re-establish pilot flame. If not pilot flame can be sensed by the flame rod circuit, terminal #3 and #4 are de-energized, and the relay will lock out on safety.
- (c) Pilot failure is caused by the following:
 - (1) Complete loss of gas supply.
 - (2) Poor ignition spark caused by low voltage, poor ground connection, faulty wiring, and possibly a defective ignition transformer.
 - (3) Low gas pressure will prevent flame rod circuit from sensing pilot flame properly.
 - (4) Unusually strong secondary air drafts can blow the pilot flame away from the flame rod momentarily causing nuisance shutdown.
 - (5) A pilot line solenoid valve will not open because of faulty wiring, low voltage, or possibly the valve is defective.
 - (6) A defective RA890 may be the cause but items (1) thru (5) should be followed first. Refer also to RA890 relay literature furnished with the control.
- (d) By referring to the Sequence of Operations step by step operation of the system can be controlled and the cause of pilot failure can be readily found. After the cause of the pilot failure has been corrected, resume normal operation by following the Lighting Instructions.

d. SHUTDOWN INSTRUCTIONS

- (1) Close manual shut-off valves and pilot valves.
- (2) Turn off main electric switch.

8. EE CONTROL SYSTEM – 5015B thru 5026B

The 5015B thru 5026B boilers utilize two EE control systems that are interconnected electrically thru all operating and safety controls. Should any of the aforementioned controls break the power supply circuit, both EE control systems would be de-energized. The succeeding paragraphs describe the function and operation of each EE Control System. Should a pilot failure on one EE Control System occur, the other EE Control System would not be affected. Thus main

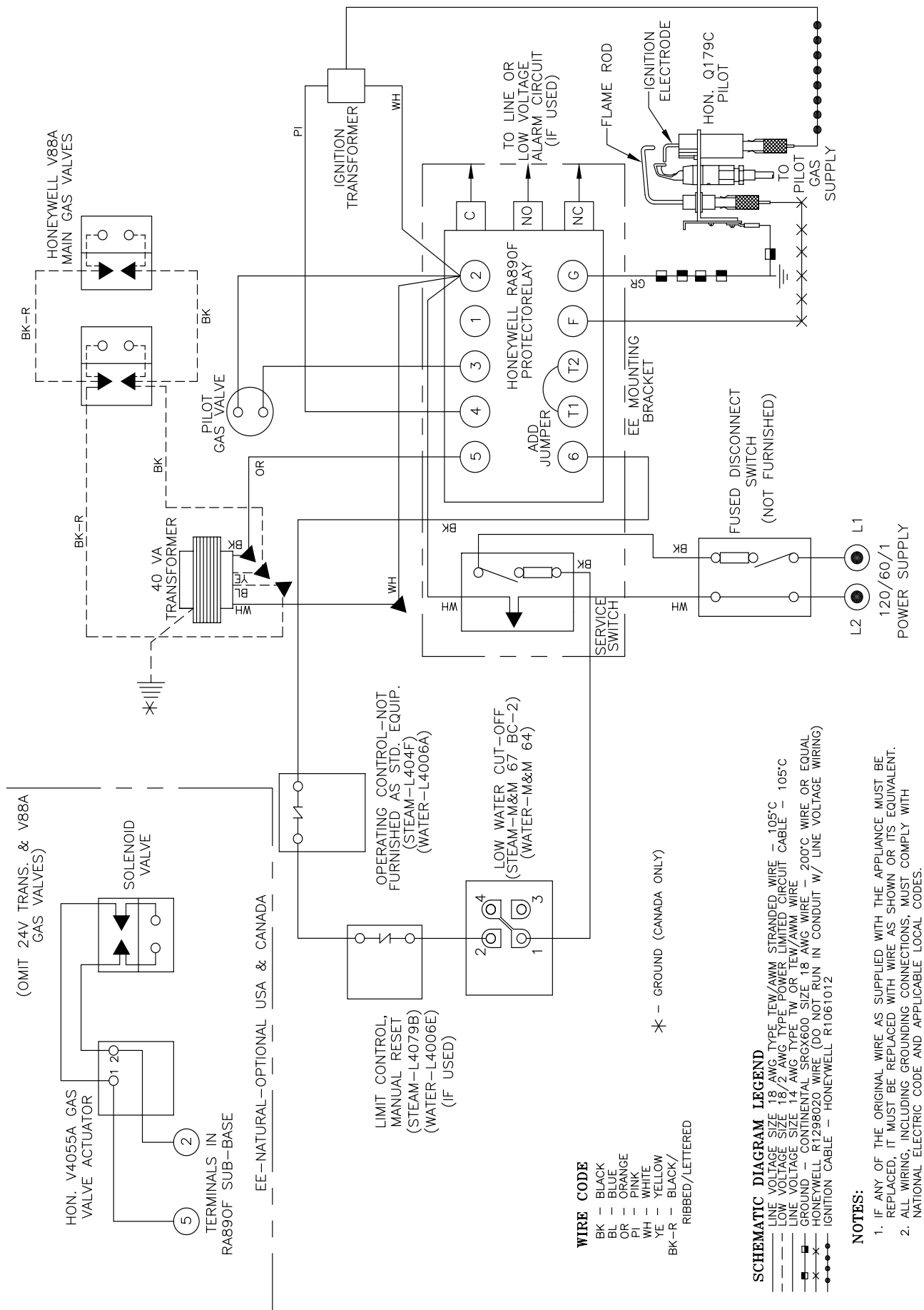


FIG. 48
 WIRING DIAGRAM - 6 THRU 14 SECT. BOILERS
 EE CONTROL SYSTEM

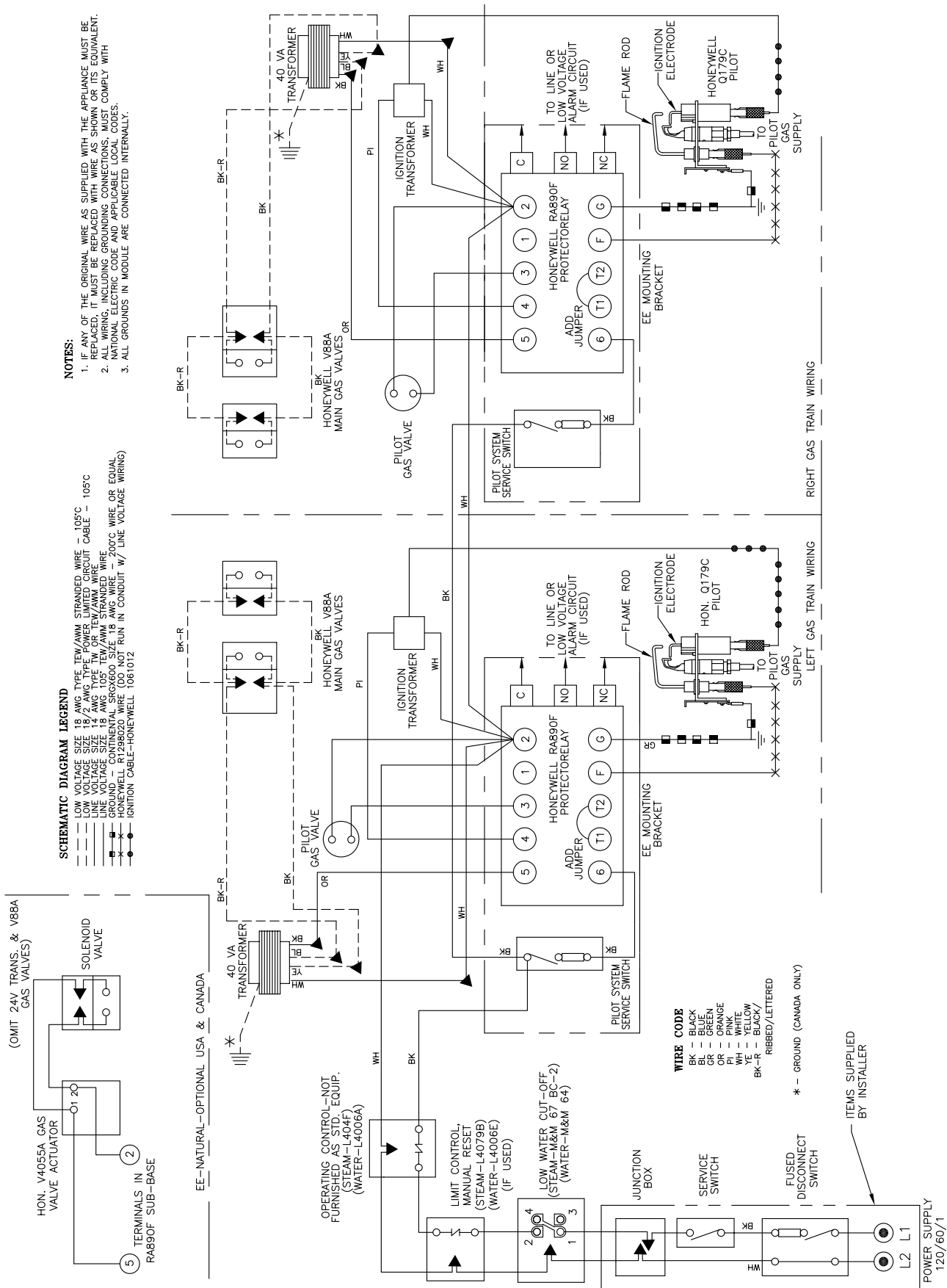


FIG. 50

WIRING DIAGRAM - 15 THRU 26 SECT. BOILERS

EE CONTROL SYSTEM

burners on the unaffected side would ignite on a “call for heat” and would continue to operate until the operating control was satisfied.

The EE Control System utilizes and RA890F Protectorelay and a Q179C Rectification Pilot, which in addition to a pilot burner and rectifying flame rod flame detector to prove pilot, includes an ignition electrode for spark ignition of the pilot. A Webster 612-6A7 Transformer supplies the high voltage spark potential. Once pilot flame is proven, ignition stops but pilot flame continues as long as there is a “call for heat” (intermittent electrically ignited pilot).

The RA890F Protectorelay Primary Control is a non-programming amplifying relay which when used with the Q179C Pilot provides solid state electronic Flame Safeguard Protection that will not allow the main gas valves to open on “call for heat” or that will shut down main burners within 0.8 second if pilot flame is not “proved”. Protectorelay will lock out on safety shutdown within 15 seconds if there is a pilot flame failure on start or, if during the “run” cycle, pilot flame is not re-established. Since #3 terminal in the Protectorelay is de-energized at end of safety switch timing, a solenoid valve in the pilot line will close and thus 100% shut-off is achieved.

a. OPERATING INSTRUCTIONS

- (1) Make sure all Manual Main Shut-off Valves and all Pilot Valves have been off for at least five minutes.
- (2) Set Operating and Limit Controls to desired settings.
- (3) Turn all Manual Main Shut-off Valves and Pilot Valves to Open Position.
- (4) Turn on Main Electric Switch and Service Switch. Pilots will automatically light main burners.

Proceed to Paragraph 15- Minimum Input Adjustments (for diaphragm “Lo-Hi-Lo” or motorized type gas valves)

SEQUENCE OF OPERATION EE – See Fig. 50

a. NORMAL OPERATION – 5015B thru 5026B

1. When the operating control calls for heat, terminal #6 of each RA890F Protectorelay is energized.
2. A component check circuit in each RA890F Protectorelay is activated which checks the electronic network of the relay.
3. Terminals #3 and #4 of each RA890F relay are energized. Terminal #3 opens the pilot line solenoid valve supplying gas to the Q179C pilot. Terminal #4 energizes ignition transformer creating electric spark ignition at the Q179C pilot.
4. Flame rod circuit between each Q179C pilot and terminal “F” on its respective RA890F proves

presence of flame electronically at its Q179C pilot.

5. Terminal #4 of each RA890F and the ignition transformer connected to it is de-energized.
6. Terminal #5 on each RA890F is energized supplying power to its respective main gas valves.
7. Main gas valves open and main burners are ignited by the pilot flames.
8. When the operating control is satisfied, terminals 6 and all other terminals on both RA890F relays are de-energized. The main gas valves and pilot valve for each gas train are closed and main burners and pilot burner flames are extinguished.

b. SAFETY SHUTDOWN

1. SAFETY SWITCH CIRCUIT

If limit control, low water cut-off or any other electrical safety switch opens, power to terminal 6 and all other terminals on both RA890 Relays is interrupted de-energizing the main gas valves and pilot valves and the main gas burners and pilot burners are immediately extinguished. Normal operation can be resumed when the cause of the safety switch malfunction is corrected. Make sure all manual resets are activated where applicable.

2. PILOT FAILURE

- (a) Pilot failure can occur during the start and operating cycle of the boiler. Any pilot failure on either of the Q179C Electronic Pilots, after ignition of pilot flame will close the pilot valve and the main gas valves controlled by that particular RA890F relay in 0.8 second. The burners controlled by the other RA890F will continue to burn.
- (b) For 15 seconds after failure of a Q179C pilot, the relay through terminals #3 and #4 will attempt to re-establish pilot flame. If no pilot flame can be sensed by the flame rod circuit in 15 seconds, terminals #3 and #4 are de-energized, and the relay will lock out on safety.
- (c) Pilot failure is caused by the following:
 - (1) Complete loss of gas supply.
 - (2) Poor ignition spark caused by low voltage, poor ground connection, faulty wiring, and possibly a defective ignition transformer.
 - (3) Low gas pressure will prevent flame rod circuit from sensing pilot flame properly.
 - (4) Unusually strong secondary air drafts can blow the pilot flame away from the flame rod momentarily causing nuisance shutdown.
 - (5) A pilot line solenoid valve will not open because of faulty wiring, low voltage, or possibly the valve is defective.

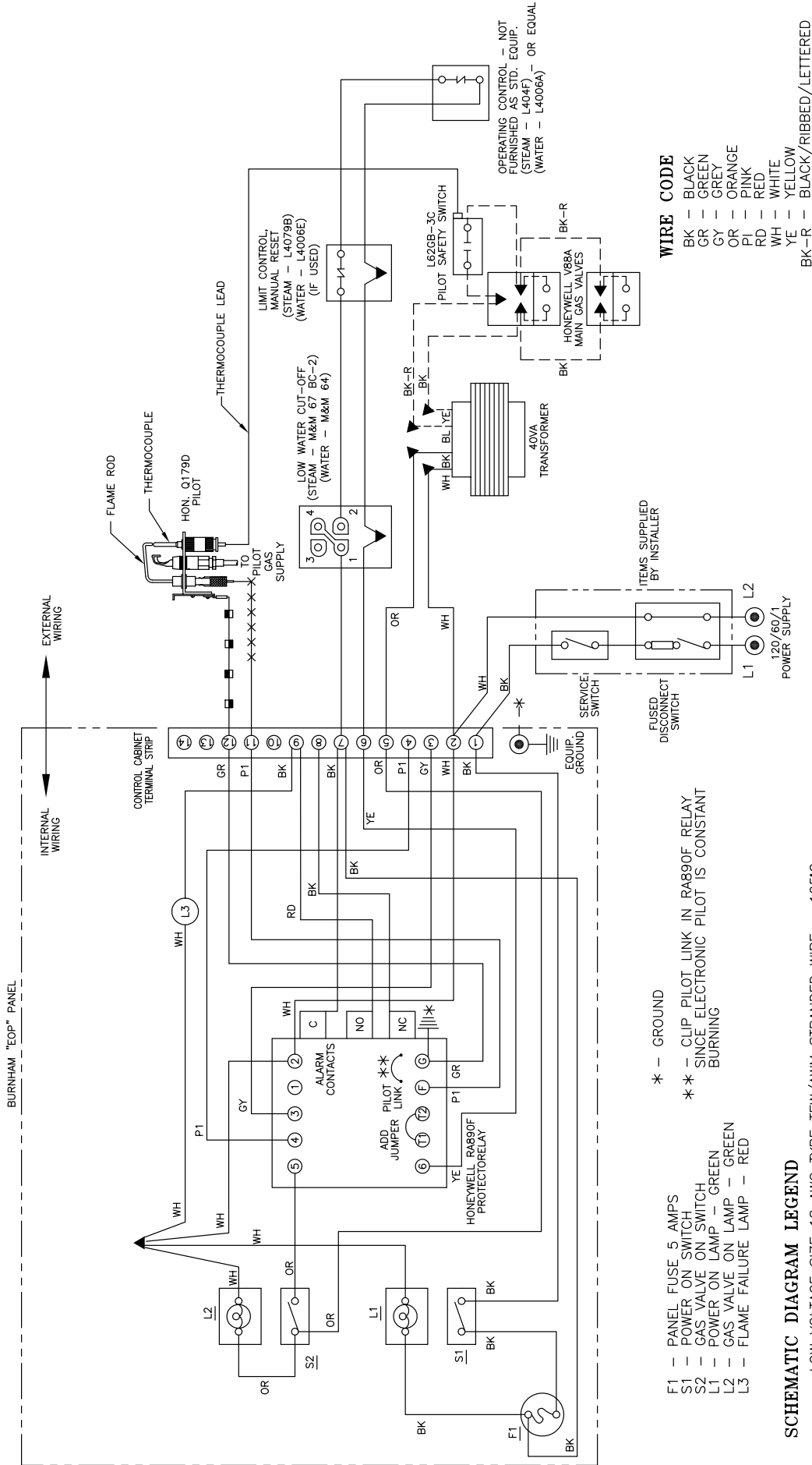


FIG. 51
WIRING DIAGRAM - 6 THRU 14 SECT. BOILERS
EOP CONTROL SYSTEM

- (6) A defective RA890 may be the cause but items (1) thru (5) should be followed first. Refer also to RA890 relay literature furnished with the control.

- (d) By referring to the Sequence of Operations step by step operation of the system can be controlled and the cause of pilot failure can be readily found. After the cause of pilot failure has been corrected, resume normal operation by following the Lighting Instructions.

d. SHUTDOWN INSTRUCTIONS

- (1) Close manual shut-off valves and pilot valves.
- (2) Turn off main electric switch.

9. EOP CONTROL SYSTEM – 5006B thru 5014B

The EOP Control System functionally is the same as the EO Control System. The RA890F Protectorelay, however, is installed in a prewired control cabinet along with a terminal strip, “main power” switch, “main gas valves” switch, “main power” lamp, “main gas valves” lamp and “pilot failure” lamp.

The RA890F Protectorelay Primary Control is a non-programming, amplifying relay which, when used with the Q179D Rectification Pilot (standing or continuous burning pilot), provides solid state electric Flame Safeguard Protection during a “call for heat” pilot failure. Should this occur, main burners will shut down within 0.8 second, “Main Gas Valves Lamp” will go off, the Protectorelay will lock out on safety shutdown within 15 seconds, and the “Pilot Failure Alarm Lamp” will be lighted. The thermocouple in the Q179D pilot will cool and, within 45 to 90 seconds, will cause the L62GB-3C Pilot Safety Switch to which it is connected to break the electrical circuit to the main gas valves as well as shutting off the flow of gas to the pilot. Thus 100% shut-off is achieved.

Should a pilot failure occur during the “off” cycle, the thermocouple in the Q179D pilot will cool and, as described above, will shut off main gas valves and flow of gas to pilot. On the next call for heat the Protectorelay will immediately sense the absence of pilot flame and the “Pilot Failure Alarm Lamp” will be lighted.

a. LIGHTING INSTRUCTIONS

- (1) Turn off all panel switches.
- (2) Turn off manual main and pilot gas valve. Wait at least five (5) minutes before proceeding.
- (3) Push safety switch reset button on this panel.
- (4) Turn on manual pilot gas valve. Push and hold pilot safety valve button and light pilot. When pilot is lit, proceed.
- (5) Set operating control to desired temperature or pressure.
- (6) Turn on *Main Power Switch*. *Main Power Light* will light.

- (7) Turn on manual main gas valve.
- (8) Turn on *Main Gas Valve Switch* to light main burners. *Main Gas Valve Light* will light.

SEQUENCE OF OPERATION EOP – See Fig. 51

b. NORMAL OPERATION – 5006B thru 5014B

- (1) When the operating control calls for heat, terminals #6 of Panel and RA890 Relay are energized.
- (2) A component self check circuit in the RA890 Relay is activated which checks the electronic network of the relay.
- (3) Flame rod circuit of the RA890 and Q179D proves presence of pilot flame electronically.
- (4) Terminal #5 is energized and supplies power to the main gas valves and main gas valve panel light providing “Gas Valve On Switch” is closed.
- (5) Main gas valves open and main burners are lighted by pilot. “Main Gas Valve” lamp will be activated.
- (6) When operating control is satisfied, terminals #6 and #5 are de-energized, “Main Gas Valve” light goes out, Main Gas Valves close, and main burners are extinguished. “Main Gas Valve” lamp will go dark.
- (7) Pilot continues to burn.
- (8) “Main Power” lamp will remain lighted.

c. SAFETY SHUTDOWN

1. SAFETY SWITCH CIRCUIT

If limit control, Low Water Cut-Off or any other electrical safety switch opens, power to terminal #6 in Panel is interrupted de-energizing terminal #5 in Panel. Main Gas Valves are thus de-energized and main gas burners are immediately extinguished. The pilot will continue to burn. Normal operation can be resumed when the cause of safety switch function is corrected. Make sure all manual resets are activated where involved.

2. PILOT FAILURE

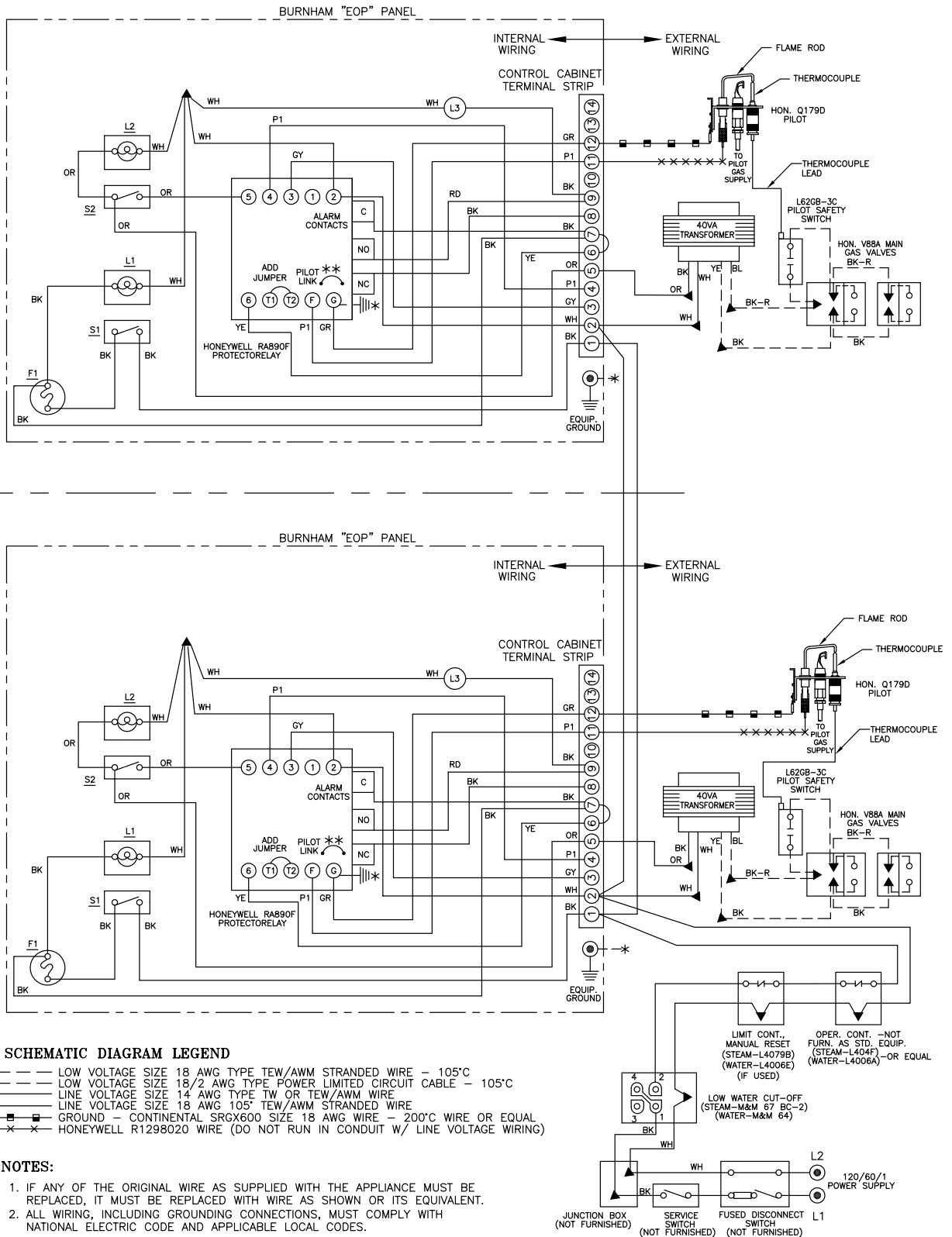
- (a) Flame rod supervision of pilot occurs only during the operating cycle (call for heat) of the operating control since the RA890 relay is energized by the operating control. If pilot failure occurs during this period, the main gas valves close and the main gas burners are extinguished within 0.8 second. After 15 seconds the relay will lock out on safety shutdown and the “Pilot Failure Alarm Lamp” will be lighted.
- (b) If pilot failure occurs during the “off” cycle of the operating control, the RA890F relay will not be powered thru terminal #6, therefore, there is no electronic flame rod supervision. This is due to the utilization of a thermocouple in the Q179D modified pilot.

F1 - PANEL FUSE 5 AMPS
 S1 - POWER ON SWITCH
 S2 - GAS VALVE ON SWITCH
 L1 - POWER ON LAMP - GREEN
 L2 - GAS VALVE ON LAMP - GREEN
 L3 - FLAME FAILURE LAMP - RED

** CLIP PILOT LINK IN RA890F RELAY
 SINCE ELECTRONIC PILOT IS CONSTANT BURNING.

* GROUND

WIRE CODE
 BK - BLACK
 GR - GREEN
 GY - GREY
 OR - ORANGE
 PI - PINK
 RD - RED
 WH - WHITE
 YE - YELLOW
 BK-R - BLACK/
 RIBBED/LETTERED



This thermocouple will cool in 45 to 90 seconds allowing the pilot line safety valve to close. This shuts off the flow of gas to the pilot. It is in this manner that 100% shut-off is achieved. If the operating control calls for heat during this period and the "Power On" switch is still in the "ON" position this relay will automatically sense the absence of pilot flame and the "Pilot Failure Alarm Lamp" will be activated as described in paragraph (a) above.

d. SHUTDOWN INSTRUCTIONS

- (1) Turn off all switches on panel(s).
- (2) Turn off manual main and pilot shut-off valves.

10. EOP CONTROL SYSTEM – 5015B thru 5026B

The 5015B thru 5026B boilers utilize two EOP Control Systems that are interconnected electrically thru all operating and safety controls. Should any of the aforementioned controls break the power supply circuit, both EOP Control Systems would be de-energized.

The succeeding paragraphs describe the function and operation of each EOP Control System. Should a pilot failure on one EOP Control System occur, the other EOP Control System would not be affected. Thus main burners on the unaffected side would ignite on a "call for heat" and would continue to operate until the operating control was satisfied.

The EOP Control System functionally is the same as the EO Control System. The RA890F Protectorelay, however, is installed in a prewired control cabinet along with a terminal strip, "main power" switch, "main gas valves" switch, "main power" lamp, "main gas valves" lamp and "pilot failure" lamp.

The RA890F Protectorelay Primary Control is a non-programming amplifying relay which, when used with the Q179D Rectification Pilot (standing or continuous burning pilot) provides solid state electronic Flame Safeguard Protection during a "call for heat" pilot failure. Should this occur, main burners will shut down within 0.8 second, "Main Gas Valves Lamp" will go off, the Protectorelay will lockout on safety shutdown within 15 seconds and the "Pilot Failure Alarm Lamp" will be lighted. The thermocouple in the Q179D pilot will cool and, within 45 to 90 seconds, will cause the L62GB-3C Pilot Safety Switch to which it is connected, to break the electrical circuit to the main gas valves as well as shutting off the flow of gas to the pilot. Thus 100% shut-off is achieved.

On the next call for heat the Protectorelay will immediately sense the absence of pilot flame and the "Pilot Failure Alarm Lamp" will be lighted.

a. LIGHTING INSTRUCTIONS

- (1) Turn off all switches on both panels.
- (2) Turn off all manual main and pilot gas valves. Wait at least five (5) minutes before proceeding.
- (3) Push safety switch reset button on both panels.

- (4) Turn on one pilot gas valve. Depress button on L62GB-3C Pilot Safety Switch to which it is connected and light pilot with match. Continue to hold button in for one minute or until pilot remains lighted after button is released. Light second pilot using same procedure.
- (5) Set operating control to desired temperature or pressure.
- (6) Turn on Main Power Switch. Main Power Lamps will light.
- (7) Turn on Manual Main Gas Valves.
- (8) Turn on Main Gas Valve Switch on both panels to light burners. Main Gas Valve Light on each panel will light.

Proceed To Paragraph 15- Minimum Input Adjustments (for diaphragm "Lo-Hi-Lo" or motorized type gas valves)

SEQUENCE OF OPERATION EOP – See Fig. 52

b. NORMAL OPERATION – 5015B thru 5026B

- (1) When the operating control calls for heat, terminal, #6 terminal of each RA890F Protectorelay is energized through terminals 1, 6 & 7 of their respective panel terminal strip.
- (2) A component self-check circuit in each RA890F relay is activated which checks the electronic network of the relay.
- (3) Flame rod circuit of each RA890F relay and its Q179D pilot proves the presence of pilot flame electronically.
- (4) Terminal #5 on each RA890F is energized, and providing the "Main Gas Valve Switch" is "ON" (circuit closed), supplies power to its respective main gas valves.
- (5) "Main Gas Valve" lamps will be lighted, main gas valves will open and main burners will be ignited by the pilot flames.
- (6) When operating control is satisfied, terminals #6 and #5 on the RA890F relays are de-energized, main gas valves close and main burners are extinguished. "Main Gas Valve" lamps will go off.
- (7) The Q179D pilots continue to burn.

c. SAFETY SHUTDOWN

(1) SAFETY SWITCH CIRCUIT

If limit control, Low Water Cut-off, operating control or any other electrical safety switch in the limit circuit opens, power to terminal #1 on both panels is interrupted, de-energizing both control panels causing all main gas valves on both sides to close and main gas burners are immediately extinguished. Both pilots will continue to burn. Normal operation can be resumed when the cause of the safety switch action is corrected. Make sure all manual resets are activated where involved.

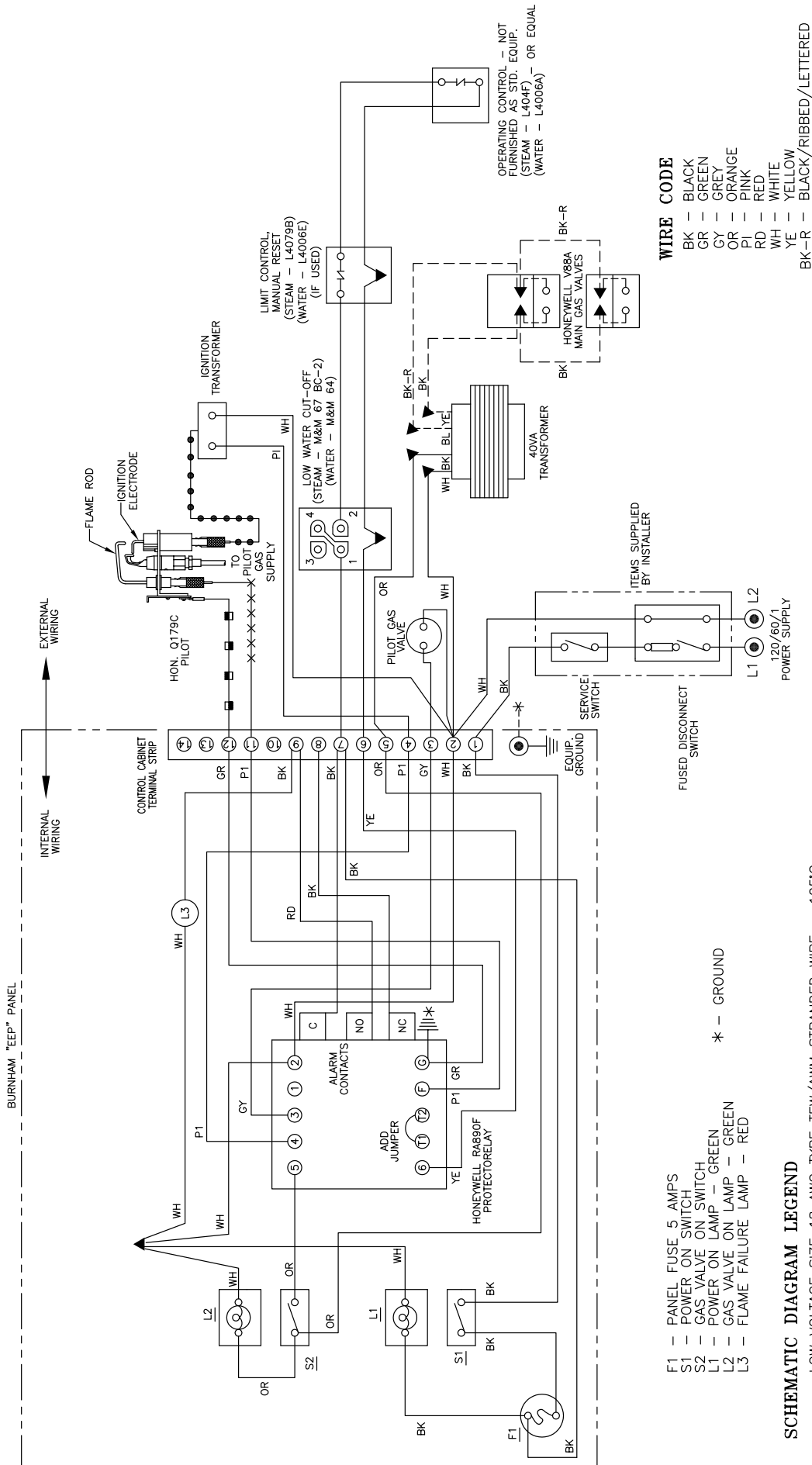


FIG. 53
WIRING DIAGRAM - 6 THRU 14 SECT. BOILERS
EEP CONTROL SYSTEM

(2) PILOT FAILURE

- (a) Flame rod supervision of the Q179D pilots occurs only during the activating cycle (call for heat) since it is during this period that the operating control is energizing the RA890F relays. If pilot failure occurs during this period on one of the Q179D pilots the main gas valves controlled by that particular RA890F will close within 0.8 second. The RA890F will lock out of safety within 15 seconds and the "Pilot Flame Failure Lamp" will be activated. The burners controlled by the other RA890F will continue to burn.
- (b) If pilot failure occurs on one of the Q179D pilots during the "off" cycle of the operating control, the RA890F relay will not be powered, therefore, there is no electronic flame rod supervision. This is due to the utilization of a thermocouple in each Q179D modified pilot which controls its own pilot safety switch. This thermocouple will cool in 45 to 90 seconds de-energizing the pilot safety switch which interrupts the circuit between the terminal #5 and the gas valves. In addition the flow of gas to the pilot is shut off and 100% shut off is achieved. If the operating control calls for heat during this period, the RA890F relay will immediately sense the absence of pilot flame and the relay will lock out on safety within 15 seconds and the "Pilot Failure Alarm Light" will be activated as described in (a) above.
- (c) Assuming the pilot on the opposite side is burning, the gas valves on that side will open and main flame will be ignited on that side only.

d. SHUTDOWN INSTRUCTIONS

- (1) Turn off all switches on both panels.
- (2) Close manual shut-off valves and pilot valves.

11. EEP CONTROL SYSTEM – 5006B thru 5014B

The EEP Control System functionally is the same as the EE Control System. The RA890F Protectorelay, however, is installed in a prewired control cabinet along with a terminal strip, "main power" switch, "main gas valves" switch, "main power" lamp, "main gas valves" lamp, and "pilot failure" lamp.

The EEP Control System utilizes an RA890F Protectorelay and a Q179C Rectification Pilot, which in addition to a pilot burner and rectifying flame rod flame detector to prove pilot, includes an ignition electrode for spark ignition of the pilot. A Webster 612-6A7 Transformer supplies the high voltage spark potential. Once pilot flame is proven, ignition stops but pilot flame continues as long as there is a "call for heat" (intermittent electrically ignited pilot).

The RA890F Protectorelay Primary Control is a non-programming amplifying relay which when used with

the Q179C Pilot provides solid state electronic Flame Safeguard Protection that will not allow the main gas valves to open on "call for heat" or that will shut down main burners and turn off "main gas valves" lamp within 0.8 second if pilot flame is not "proved". Protectorelay will lockout on safety shutdown within 15 seconds if there is a pilot flame failure on start or, if during the "run" cycle, pilot flame is not re-established. "Pilot failure alarm lamp" will come on. Since #3 terminal in the Protectorelay is de-energized at end of safety switch timing, a solenoid valve in the pilot line will close and thus 100% shut-off is achieved.

a. OPERATING INSTRUCTIONS

- (1) Turn off all panel switches.
- (2) Turn off manual main and pilot gas valve. Wait at least five (5) minutes before proceeding.
- (3) Push safety switch reset button on this panel.
- (4) Turn on manual pilot gas valve.
- (5) Set operating control to desired temperature or pressure.
- (6) Turn on *Main Power Switch*. *Main Power Light* will light. If all safety control and operating control switches are closed, electronic pilot will light.
- (7) Turn on manual main gas valve(s).
- (8) Turn on *Main Gas Valve Switch* to light main burners. *Main Gas Valve Lamp* will light.

Proceed To Paragraph 15- Minimum Input Adjustments (for diaphragm "Lo-Hi-Lo" or motorized type gas valves).

SEQUENCE OF OPERATION EEP – See Fig. 53

b. NORMAL OPERATION – 5006B thru 5014B

- (1) When the operating control calls for heat, terminals #6 of Panel and RA890F Relay are energized.
- (2) A component check circuit in the RA890F Relay is activated which checks the electronic network in the relay.
- (3) Terminals #3 and #4 of the panel and relay are energized. Terminal #3 opens pilot line solenoid valve supplying gas to pilot. Terminal #4 energizes ignition transformer creating electric spark ignition at pilot.
- (4) Flame rod circuit between Q179C pilot and terminal "F" on RA890F proves presence of pilot flame electronically.
- (5) Terminal #4 to ignition transformer is de-energized after flame is proven at Q179C.
- (6) Terminal #5 on RA890F is energized and supplies power to the main gas valves. "Main Gas Valve" panel lamp will light providing "Main Gas Valve" switch is "ON" (circuit closed).
- (7) Main gas valves open and main burners are lighted by pilot.

- (8) When the operating control is satisfied, terminals #6 in the panel and relay are de-energized. Terminal #5, "Main Gas Valve" lamp, Main Gas Valves, and Pilot Line Solenoid Valve are all de-energized and main burner and pilot burner flames are extinguished.
- (9) "Main Power" lamp remains lighted.

c. SAFETY SHUTDOWN

(1) SAFETY SWITCH CIRCUIT

If limit control, Low Water Cut-Off or any other electrical safety switch opens, power to terminal #6 in Panel is interrupted thus de-energizing terminal #5 in Panel. Consequently Main Gas Valves are de-energized and main burners are immediately extinguished. Normal operation can be resumed when the cause of safety switch malfunction is corrected. Make sure all manual resets are activated where involved.

(2) PILOT FAILURE:

- (a) Pilot failure can only occur during the operating cycle of the boiler. Any pilot failure on the Q179C Electronic Pilot, after ignition of pilot flame, will close the main gas valves in 0.8 second.
- (b) For 15 seconds, after failure of the Q179 pilot, the relay through terminals #3 and #4 will try to re-establish pilot flame. If no pilot flame can be sensed by the flame rod circuit, terminals #3 and #4 are de-energized, the relay will lock out of safety. "Pilot Failure Alarm Lamp" will be activated.
- (c) Pilot failure is caused by the following:
 - (1) Complete loss of gas supply.
 - (2) Poor ignition spark caused by low voltage, poor ground connection, faulty wiring, and possibly a defective ignition transformer.
 - (3) Low gas pressure will prevent flame rod circuit from sensing pilot flame properly.
 - (4) Unusually strong secondary air drafts can blow the pilot flame away from the rod momentarily causing nuisance shut-down.
 - (5) A pilot line solenoid valve will not open because of faulty wiring, low voltage, or possibly the valve is defective.
 - (6) A defective RA890 may be the cause but items (1) thru (5) should be followed first. See also RA890 relay literature furnished with the panel system.
 - (7) By referring to the Sequence of Operations, step by step operation of the system can be controlled with diligent use of the switches in the Panel(s). In this manner the cause of pilot failure can be readily found. After

the cause of pilot failure has been corrected, resume normal operation by following the Lighting Instructions on the Panel.

d. SHUTDOWN INSTRUCTIONS

- (1) Turn off switches on panel.
- (2) Close manual shut-off valve and pilot valve.

12. EEP CONTROL SYSTEM – 5015B thru 5026B

The 5015B thru 5026B boilers utilize two EEP Control Systems that are interconnected electrically thru all operating and safety controls. Should any of the aforementioned controls break the power supply circuit, both EEP Control Systems would be de-energized.

The succeeding paragraphs describe the function and operation of each EEP Control System. Should a pilot failure on one EE Control System occur, the other EEP Control System would not be affected. Thus main burners on the unaffected side would ignite on a "call for heat" and would continue to operate until the operating control was satisfied.

The EEP Control System functionally is the same as the EE Control System. The RA890F Protectorelay however, is installed in a prewired control cabinet along with a terminal strip, "main power" switch, "main gas valves" switch, "main power" lamp, "main gas valves" lamp, and "pilot failure" lamp.

The EEP Control System utilizes an RA890F Protectorelay and a Q179C Rectification Pilot, which in addition to a pilot burner and rectifying flame rod flame detector to prove pilot, includes an ignition electrode for spark ignition of the pilot. A Webster 612-6A7 Transformer supplies the high voltage spark potential. Once pilot flame is proven, ignition stops but pilot flame continues as long as there is a "call for heat" (intermittent electrically ignited pilot).

The RA890F Protectorelay Primary Control is a non-programming amplifying relay which when used with the Q179C Pilot provides solid state electronic Flame Safeguard Protection that will not allow the main gas valves to open on "call for heat" or that will shut down main burners and turn off "Main Gas Valves" lamp within 0.8 second if pilot flame is not "proved". Protectorelay will lockout on safety shutdown within 15 seconds if there is a pilot flame failure on start or, if during the "run" cycle, pilot flame is not re-established, "Pilot Failure Alarm Lamp" will come on. Since #3 terminal in the Protectorelay is de-energized at end of safety switch timing, a solenoid valve in the pilot line will close and thus 100% shut-off is achieved.

a. OPERATING INSTRUCTIONS

- (1) Turn off all switches on both panels.
- (2) Turn off all manual main and pilot gas valves. Wait at least five (5) minutes before proceeding.
- (3) Push safety reset button on both panels.
- (4) Set Operating Control to desired temperature or pressure.

F1 - PANEL FUSE 5 AMPS
 S1 - POWER ON SWITCH
 S2 - GAS VALVE ON SWITCH
 L1 - POWER ON LAMP - GREEN
 L2 - GAS VALVE ON LAMP - GREEN
 L3 - FLAME FAILURE LAMP - RED

* GROUND

WIRE CODE

BK - BLACK
 GR - GREEN
 GY - GREY
 OR - ORANGE
 P1 - PINK
 RD - RED
 WH - WHITE
 YE - YELLOW
 BK-R - BLACK/
 RIBBED/LETTERED

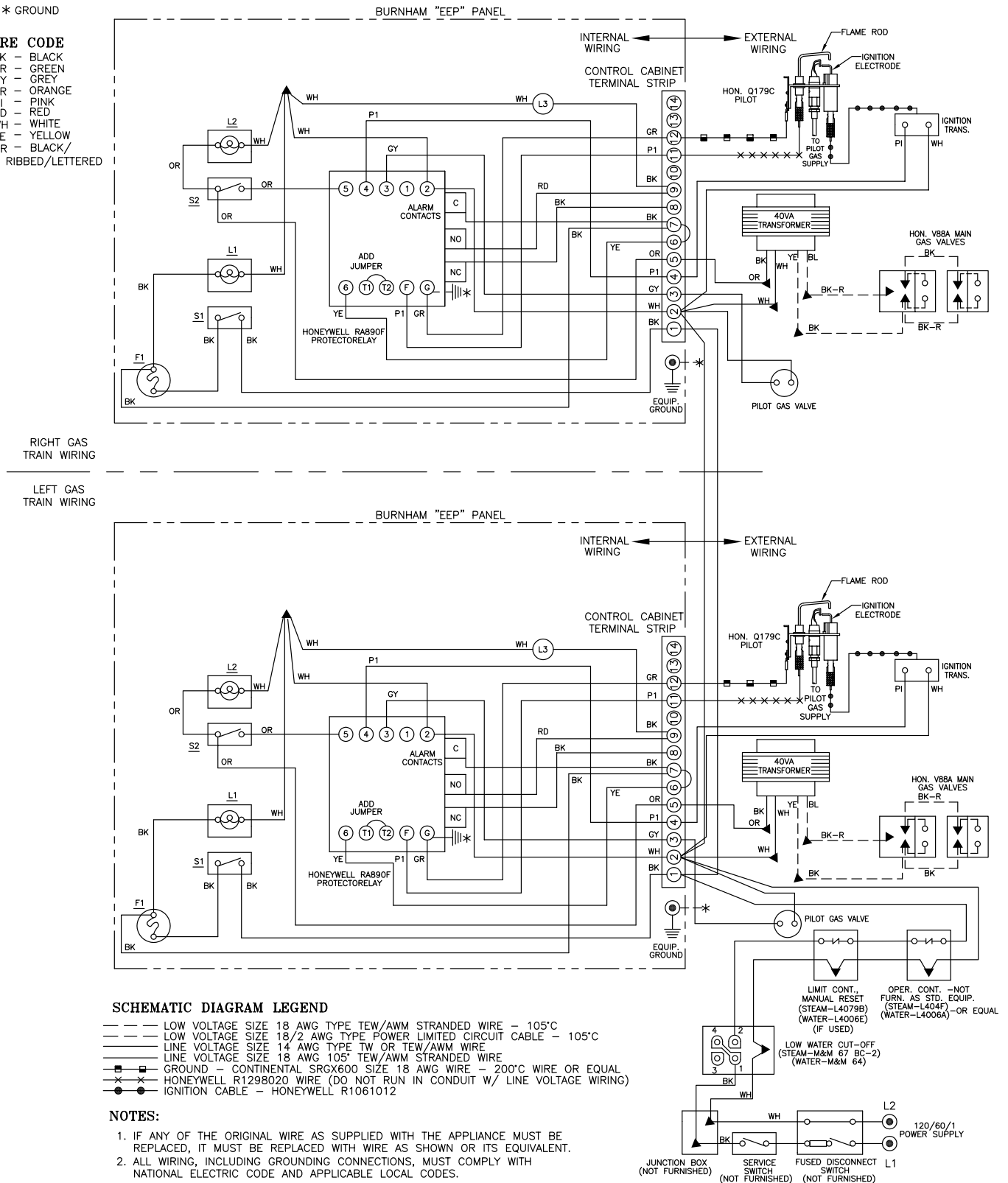


FIG. 54
 WIRING DIAGRAM - 15 THRU 26 SECT. BOILERS
 EEP CONTROL SYSTEM

- (5) Turn on Main Power Switch on both panels. Main Power Lamp on each panel will light.
- (6) Turn on manual pilot valves. Both pilots should light.
- (7) Turn on Manual Main Gas Valves.
- (8) Turn on Main Gas Valve Switch on both panels to light burners. Main Gas Valve Lamp on each panel will light.

Proceed To Paragraph 15- Minimum Input Adjustments (for diaphragm “Lo-Hi-Lo” or motorized type gas valves)

SEQUENCE OF OPERATION EEP – See Fig. 54

b. NORMAL OPERATION – 5015B thru 5026B

- (1) When the operating control calls for heat, terminal #6 of both panels and both RA890F relays are energized.
- (2) A component self check circuit on each RA890F relay is activated which checks the electronic network of the relay.
- (3) Terminals #3 and #4 on both panels and RA890F relays are energized. Terminal #3 opens pilot line solenoid valve supplying gas to the Q179C pilot. Terminal #4 energizes the ignition transformer creating electric spark ignition at the Q179C pilot.
- (4) Flame rod circuit between each Q179C pilot and terminal “F” on its respective RA890F proves presence of flame electronically at its Q179C pilot.
- (5) Terminal #4 to ignition transformer is de-energized after flame is proven at its Q179C.
- (6) Terminal #5 on each RA890F is energized supplying power to its respective main gas valves. “Main Gas Valve” panel lamps will light providing “Main Gas Valve” switches are “ON” (circuits closed).
- (7) Main gas valves open and main burners are ignited by the pilot flames.
- (8) When the operating control is satisfied, terminals #6 and all other terminals on both RA890F relays and panels are de-energized. “Main Gas Valve” lamps go “OFF”, the main gas valves and pilot valve for each gas train are closed and main burners and pilot burner flames are extinguished.
- (9) “Main Power” lamp remains lighted.

c. SAFETY SHUTDOWN

(1) SAFETY SWITCH CIRCUIT

If limit control, low water cut-off or any other electrical safety switch opens, power to terminal #6 and all other terminals on both RA890 relays and panels is interrupted de-energizing the main gas valves and pilot valves. Main gas burners and pilot burners are immediately extinguished. Normal operation can be resumed when the cause of safety switch malfunction is corrected.

Make sure all manual resets are activated where applicable.

(2) PILOT FAILURE

- (a) Pilot failure can only occur during the operating cycle of the boiler. Any pilot failure on either of the Q179C Electronic Pilot, after ignition of pilot flame, will close the pilot valve and the main gas valves controlled by that particular RA890F relay in 0.8 second. The burners controlled by the other RA890F will continue to burn.
- (b) For 15 seconds, after failure of a Q179C pilot, the relay through terminals #3 and #4 will try to re-establish pilot flame. If no pilot flame can be sensed by the flame rod circuit in 15 seconds, terminals #3 and #4 are de-energized, and the relay will lock out on safety. “Pilot Failure Alarm Lamp” will be activated.
- (c) Pilot failure is caused by the following:
 - (1) Complete loss of gas supply.
 - (2) Poor ignition spark caused by low voltage, poor ground connection, faulty wiring, and possibly a defective ignition transformer.
 - (3) Low gas pressure will prevent flame rod circuit from sensing pilot flame properly.
 - (4) Unusually strong secondary air drafts can blow the pilot flame away from the rod momentarily causing nuisance shut-down.
 - (5) A pilot line solenoid valve will not open because of faulty wiring, low voltage, or possibly the valve is defective.
 - (6) A defective RA890 may be the cause but items (1) thru (5) should be followed first. See also RA890 relay literature furnished with the panel system.
 - (7) By referring to the Sequence of Operations, step by step operation of the system can be controlled and the cause of pilot failure can be readily found. After the cause of pilot failure has been corrected, resume normal operation by following the Lighting Instructions on the panel.

d. SHUTDOWN INSTRUCTIONS

- (1) Turn off all switches on both panels.
- (2) Close manual shut-off valve and pilot valve.

13. THERMOCOUPLE CONTROL SYSTEM (Canada Only)

The 5006B thru 5013B boilers are equipped with a Thermocouple Control System that utilizes a constant-burning Q327A pilot, a Q309 thermocouple, and a L62GB-3C Pilot Safety Switch. The Q309

thermocouple proves pilot flame and, in the absence of such, will cool and, within 45 to 90 seconds, will cause the L62GB-3C Pilot Safety Switch to which it is connected, to break the electrical circuit to the main gas valves as well as shut off the flow of gas to the pilot. Thus, 100% shut-off is achieved.

The 5015B thru 5024B boilers utilize two Thermocouple Control Systems that are interconnected electrically thru all operating and safety controls. Should any of the aforementioned controls break the power supply circuit, both Thermocouple Control Systems would be de-energized. The proceeding paragraph describes the function and operation of each Thermocouple Control System. Should a pilot failure on one Thermocouple Control System occur, the other Thermocouple Control System would not be affected. Thus main burners on the unaffected side would ignite on a "call for heat" and would continue to operate until the operating control was satisfied.

When operating control (A) calls for heat, it energizes main gas valves (B), starting burner operation.

The burners will operate until operating control (A) is satisfied. The high limit control (C), will stop burner operation in case of excessive steam pressure (steam boiler) or excessive boiler water temperature (water boiler).

Low water cut-off (D) will stop burner operation if the water level in boiler drops below the lowest safe level.

The pilot safety switch (E), connected to main gas valve (B), prevents operation of the main burners in case the pilot flame becomes extinguished. Pilot safety switch (E) provide for 100% shut-off of gas supply.

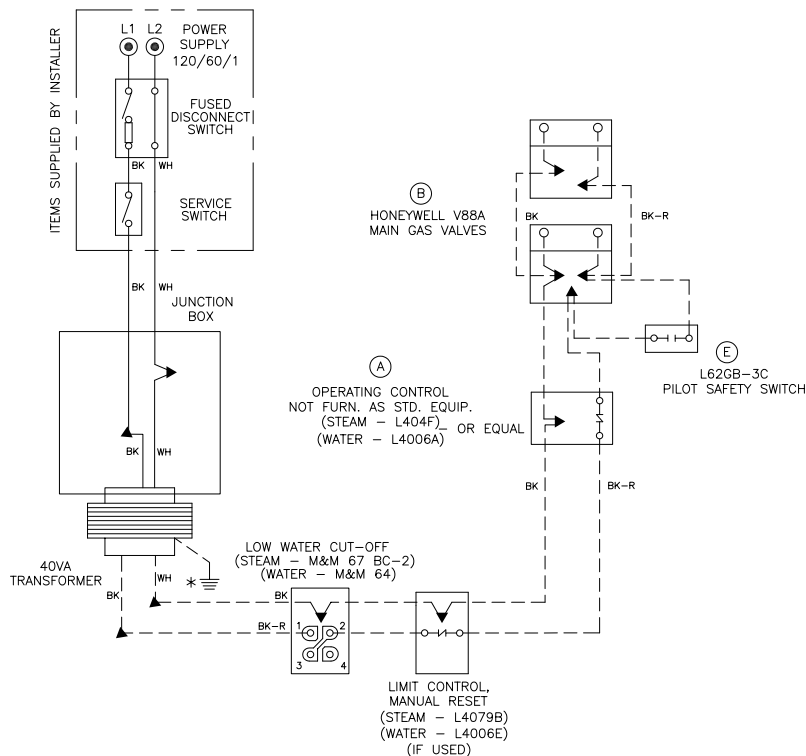
a. LIGHTING INSTRUCTIONS

- (1) Make sure that all main manual and pilot valves have been off for at least five (5) minutes.
- (2) Set operating and limit controls to desired setting.
- (3) Open pilot valve.
- (4) Depress button on pilot safety switch to which it is connected and hold lighted match on pilot. Hold button in for at least one minute, or until the pilot burner remains lit after the button is released. Repeat for second pilot when boiler is so equipped.
- (5) Open manual main shut-off valve(s).
- (6) Turn on main electric switch.

NORMAL OPERATION SEQUENCE

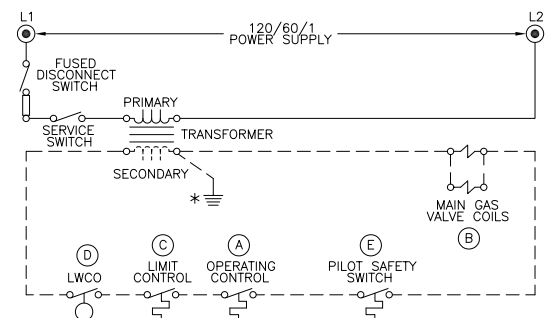
5006B thru 5013B, see Fig. 55

5015B thru 5024B, see Fig. 56



SCHEMATIC DIAGRAM LEGEND

- LOW VOLTAGE SIZE 18 AWG TYPE TEW/AWM STRANDED WIRE - 105°C
- LOW VOLTAGE SIZE 18/2 AWG POWER LIMITED, CIRCUIT CABLE - 105°C
- LINE VOLTAGE SIZE 14 AWG TYPE TW OR TEW/AWM WIRE



LADDER DIAGRAM LEGEND

- 24V INTERNAL WIRING
- 24V EXTERNAL WIRING
- 120V EXTERNAL WIRING

NOTES:

1. IF ANY OF THE ORIGINAL WIRE AS SUPPLIED WITH THE APPLIANCE MUST BE REPLACED, IT MUST BE REPLACED WITH WIRE AS SHOWN OR ITS EQUIVALENT.
2. ALL WIRING, INCLUDING GROUNDING CONNECTIONS, MUST COMPLY WITH NATIONAL ELECTRIC CODE AND APPLICABLE LOCAL CODES.

WIRE CODE

- BK - BLACK
- BK-R - BLACK/RIBBED/LETTERED
- BL - BLUE
- WH - WHITE
- YE - YELLOW

FIG. 55
WIRING DIAGRAM - 6 THRU 13 SECT. BOILERS
THERMOCOUPLE CONTROL SYSTEM
CANADA ONLY

When the operating control (A) calls for heat, it energizes the main gas valves (B) in both gas trains starting burner operation. The burners will operate until the operating control is satisfied. The high limit control (C) will stop burner operation in case of excessive steam pressure (steam boiler) or excessive boiler water temperature (water boiler).

The low water cut-off (D) will stop burner operation if the water level in the boiler drops below the lowest safe level.

Should one of the pilot flames become extinguished the pilot safety switch (E) to which it is connected would shut off the gas supply to that pilot and to the main gas valves and burners it is serving (100% shut-off). Operation of the burners supplied by the second gas train will be unaffected.

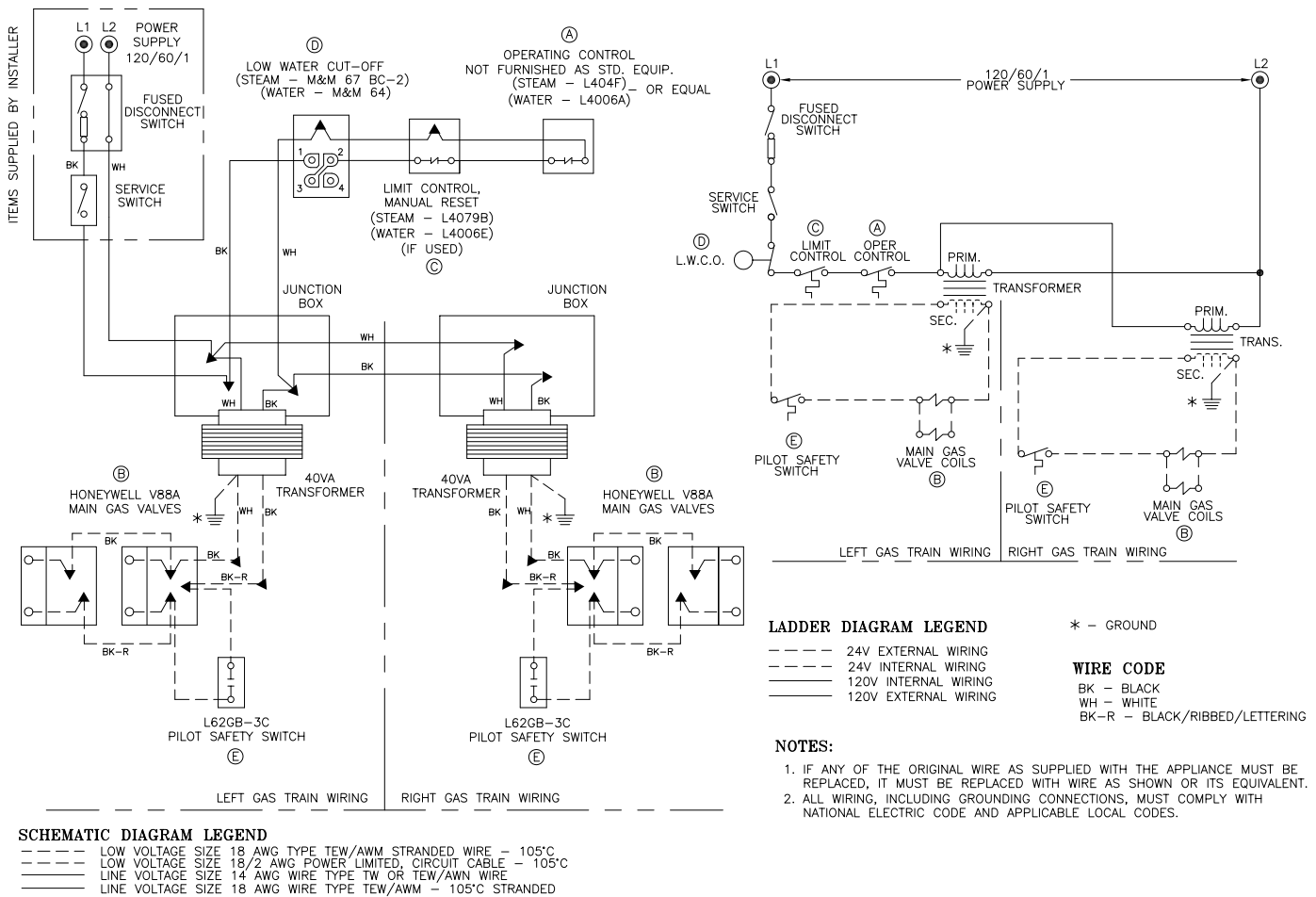


FIG. 56
WIRING DIAGRAM - 15 THRU 24 SECT. BOILERS
THERMOCOUPLE CONTROL SYSTEM
CANADA ONLY

14. CHECK GAS INPUT RATE TO BOILER

- (1) Input Rate and Maximum Inlet Pressure shown on Rating Plate must not be exceeded. Inlet pressure must not be lower than minimum inlet pressure shown on Rating Plate.
- (2) All Rate checks and all adjustments are to be made while boiler is firing – all other appliances connected to the same meter as the boiler must be off.
- (3) Water Manometer or water column gauge should be connected to a shut-off valve installed in the 1/8" pipe tapping in each manifold – boiler off. By installing gas valve upstream of manometer, gas pressure can be introduced gradually – without shut-off valve, surge of pressure when boiler is turned on, could blow liquid out of manometer.
- (4) LP Gas Input
 - (a) Adjust Gas Train Regulator(s) so that manifold pressure is ten (10) inches water column. Turning Regulator Adjusting Screw Clockwise increases pressure, Counterclockwise rotation decreases pressure. If boiler is equipped with two manifolds (5015B thru 5026B), pressure in each must be equal.
- (5) Natural Gas Input
 - (a) Approximate Input – Adjust Gas Train Regulator(s) so that manifold pressure is three and a half (3½) inches from water column. Turning Regulator Adjusting Screw Clockwise increases pressure, Counterclockwise rotation decreases pressure. If boiler is equipped with two manifolds, pressure in each must be equal. If more accurate check on input is necessary, see (b) below.
For minor input changes readjust Gas Train Regulator(s) to increase or decrease manifold pressure to obtain corresponding increase or decrease in gas input. If it is necessary to increase manifold pressure more than 0.3" of water to obtain rated input, remove orifices and drill one size larger. Reinstall and recheck input rate.
 - (b) Additional Check on Input – Since input is a function of heating value, specific gravity and volume of gas flow contact your utility for the first two items in order to utilize the formula below. The gas meter should then be clocked for three (3) minutes with stop watch

and substituting the appropriate values in the formula below, determine what the gas flow should be in this 3 minute period to give the input shown on the Rating Plate:

$$\text{cu. ft. per 3 min.} = \frac{\text{Btuh Input}}{\text{Heating Value of gas (Btu/cuft)} \times 20 \times \text{multiplier (from table below)}}$$

<u>spec. gravity</u>	<u>multiplier</u>
.50	1.10
.55	1.04
.60	1.00
.65	0.96
.70	0.93

- (c) ADJUST AIR SHUTTERS – See Section V
Burners are normally shipped with the air shutters in the wide open position. Loosen air shutter securing screws and close air shutters until yellow tips appear on flames, then open shutters slowly until defined inner cones may be seen. Lock shutters in this position.
- (d) ADJUST BLEED LINE REGULATOR (V88A's)
All gas boilers for the USA and Canada are normally equipped with two diaphragm gas valves per manifold. The gas valve(s) nearest the manifold on all boilers, is equipped with an adjustable bleed. This bleed regulator should be adjusted so that the burners reach full fire in approximately 10-12 seconds after the main gas valves have been energized.
- (e) ADJUST PILOT LINE PRESSURE – See Section V - Service; 7. Pilot Flame
Shut down boiler and remove gas valve and manometer from 1/8" pipe tapping in each manifold. Plug tappings with square head pipe plugs. Install gas valve in tee in each pilot line. Connect manometer to each gas valve and, with boiler in operation, set pilot line pressure at 5.5" water – natural gas boilers and 6.5" water – propane gas boilers.
Shut boiler down, remove gas valves and manometers and plug tees with square head pipe plugs. Restart boiler.

CAUTION

The following procedures should only be performed by a qualified service technician.

15. MINIMUM INPUT ADJUSTMENTS

This section covers Minimum Input Adjustments on Honeywell V8944B Diaphragm Type “Lo-Hi-Lo” Gas Valves, Honeywell V5055B Fluid Power Gas Valves equipped with either a V4062A “Lo-Hi-Lo” Actuator or a V9055A “Modulating” Actuator.

a. Minimum Input Adjustments – “Lo-Hi-Lo”

Combination Valve, V8944B (Natural Gas Only)

On boilers equipped with the V8944B combination diaphragm valve/regulator, Low Fire Adjustment should not be less than Minimum Input shown on Rating Plate (1/3 of full rated input). Fig. 57 shows the outlet pressure adjustment screws for low and high fire. The V8944B low and high fire pressure settings are factory set at 0.8” and 3.5” W.C. respectively. If further adjustments are necessary, remove pressure regulator adjustment caps and insert a screwdriver to raise or lower the regulator pressure.

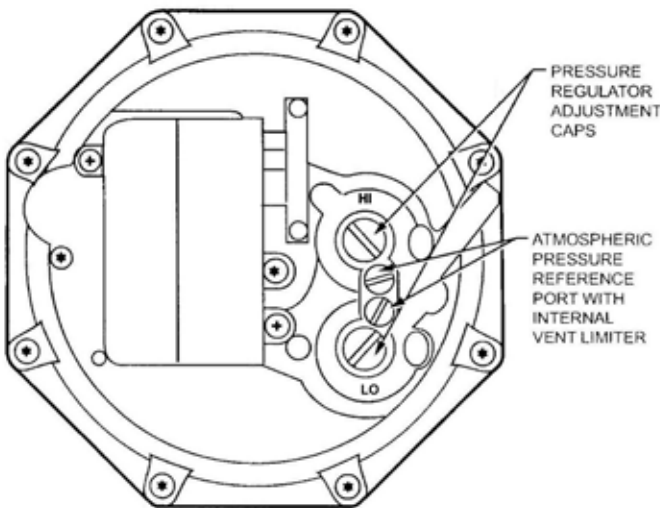


FIG. 57
V8944B COMBINATION VALVE

b. MINIMUM INPUT ADJUSTMENTS – “LO-HI-LO” MOTORIZED ACTUATOR, V4062A

On boilers equipped with Fluid Power Valves that have “Lo-Hi-Lo” Actuator, Low Fire Adjustment should not be less than Minimum Input shown on Rating Plate (1/3 of full rated input).

Fig. 58A shows the Limit Switch Cam and Scales to indicate direction to rotate cam for increasing or decreasing low fire input on the Honeywell V4062A “Lo-Hi-Lo” Actuator. To adjust the low fire setting after the burners are “on”, the following procedure should be used.

- (1) With power to actuator “off”, remove the wiring compartment cover.
- (2) Check to be sure the low fire adjustment is set at MAX to insure a safe light-off. (Low fire adjustment is preset at factory in the MAX position.)
- (3) Disconnect the controller lead from terminal #4 on the actuator to keep the valve in the low fire position.
- (4) Start the system and establish the main burner flame.
- (5) Loosen the setscrew in the cam (Fig. 58A) with the special wrench taped to inside of actuator cover. Keep the wrench seated in the setscrew. Rotate the cam slightly downward (by moving the wrench toward the base of actuator) to open bleed valve. Actuator will start to close.
- (6) When valve reaches desired low fire position, quickly tighten setscrew and remove wrench. If the desired low fire setting is “missed”, merely loosen the setscrew and rotate cam in the opposite direction to the desired set point.
- (7) Shut down burner, and then restart. Repeat several times to be sure the low fire setting is that desired and suitable for correct burner lightoff. Readjust if necessary.
- (8) Disconnect power and reconnect controller lead removed in step (3) above.
- (9) Replace the wiring compartment cover.

c. MINIMUM INPUT ADJUSTMENTS – MOTORIZED “MODULATING” ACTUATOR, V9055A

On boilers equipped with Fluid Power Valves that have “Modulating” Actuators, Low Fire Adjustment should not be less than Minimum Input shown on Rating Plate (1/3 of full rated input).

Fig. 58B shows the Low Fire Adjusting Screw for increasing or decreasing low fire input on the Honeywell V9055A “Modulating” Actuator. To adjust the low fire setting after the burners are “on”, the following procedure should be used.

- (1) With power to actuator “off”, remove the wiring compartment cover.
- (2) Check to make sure the low fire adjustment is set at MAX (full clockwise) to insure a safe light-off. (Low fire adjustment is preset at the factory in the MAX position.)
- (3) Remove the lead to V9055A terminal R. Jumper terminal R to W. This will prevent the actuator from going to the high fire position.
- (4) Energize the system and light the main burner.
- (5) Use a Phillips screwdriver, or standard type with a blade no more than 3/16 inch wide, to turn the low fire adjusting screw for the desired low fire position. DO NOT PUSH INWARD ON SCREW.

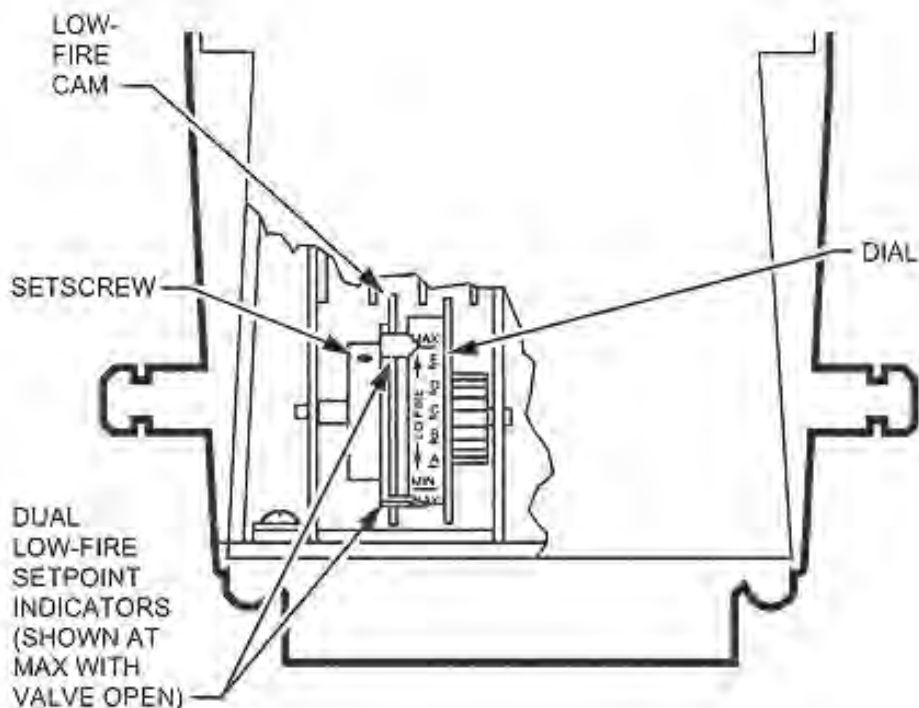


FIG. 58A
LOW FIRE ADJUSTMENT - V4062 ACTUATOR

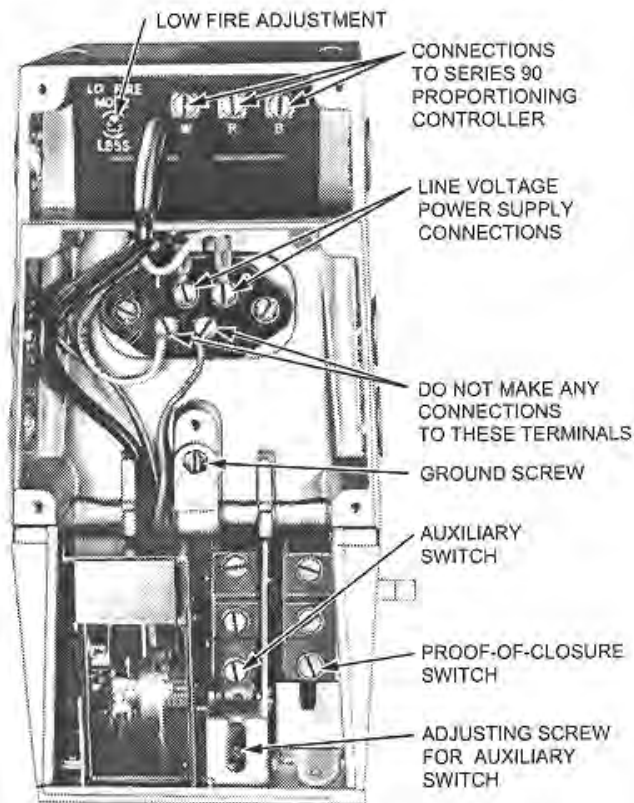


FIG. 58B
LOW FIRE ADJUSTMENT - V9055A ACTUATOR

- (6) Shut down the burner, and then restart. Repeat several times to be sure the low fire setting is that desired and suitable for correct burner light off.
- (7) Turn off power supply. Remove R-W jumper, and reconnect the lead to terminal R on the V9055A.
- (8) Replace the wiring compartment cover.
16. MAIN BURNER FLAMES should have a clearly defined inner cone, see Fig. 63 with no yellow tipping. Orange-yellow streak caused by dust should not be confused with true yellow tipping.
17. CHECK PILOT FLAME. Flame should be a blue medium hard flame enveloping approximately 3/8" of the end of the thermocouple, flame sensor, or sensing probe, see Fig. 64 thru 67.
18. CHECK THERMOSTAT OPERATION. Raise and lower thermostat setting as required to start and stop burners.
19. CHECK HIGH LIMIT CONTROL. Jumper Thermostat terminals or thermostat Connections in Limit Control. Allow burners to operate until shutdown by limit. REMOVE JUMPER.
20. TEST IGNITION SYSTEM SAFETY SHUT-OFF DEVICE AS FOLLOWS:

Place the boiler into operation by following the appropriate lighting instructions in this manual.

Proceed with test as follows:

a. *Thermocouple Pilot System*

Using a 3/8" wrench loosen the thermocouple lead at the gas valve. Main gas and pilot gas must shut off. If not, replace gas valve.

b. *EI Pilot System*

Carefully remove ignitor sensor wire from ignition module. Main gas and pilot gas must shut off immediately. If not, replace the module.

c. *EO, EOP, EE and EEP Pilot Systems*

Carefully remove the flame rod wire from terminal "F" on the RA890F protectorelay. Main gas and pilot gas must shut off. If not, replace the RA890F.

21. COMBUSTION CHAMBER BURN-OFF

- a. The mineral wool combustion chamber panels contain a cornstarch based binder that must be burned out at installation to prevent odors during subsequent boiler operation.

- b. Ventilate the boiler room, set the high limit to its maximum setting, set the thermostat to call for heat. Allow the boiler to fire for at least an hour or until the odor from the cornstarch has dissipated.
- c. Return the high limit and thermostat to their desired settings.

CAUTION

Avoid operating this boiler in an environment where saw dust, loose insulation fibers, dry wall dust, etc. are present. If boiler is operated under these conditions, the burner interior and ports must be cleaned and inspected daily to insure proper operation.

SECTION V – SERVICE

1. GENERAL – “Inspection should be conducted annually. Service as frequently as specified in paragraphs below.” While service or maintenance is being done, Electrical Power and all Gas Supply to the Boiler must be “off”.

CAUTION

Label all wires prior to disconnection when servicing controls. Wiring errors can cause improper and dangerous operation. Verify proper operation after servicing.

2. VENT SYSTEM – Vent system should be checked annually for:
 - a. obstructions
 - b. accumulations of soot
 - c. deterioration of vent pipe or vent accessories due to condensation or other reasons
 - d. proper support – no sags, particularly in horizontal runs
 - e. tightness of joints

Remove all accumulations of soot with wire brush and vacuum. Remove all obstructions. Replace all deteriorated parts and support properly. Seal all joints. See Fig. 61.

3. CLEANING OF FLUES AND BURNERS – Flue passageways in the boiler sections should be checked annually for any blockage or accumulation of soot. To obtain access to the flue cleanout panels, which are installed on both the front and rear of the boiler, the upper front and upper rear jacket panels must be removed, see Fig. 59. Also remove front vestibule panel. See Fig. 18.
Remove the Front Cleanout Panels first by removing the upper and lower nuts and washers securing these panels to the boiler sections, see Fig. 60.

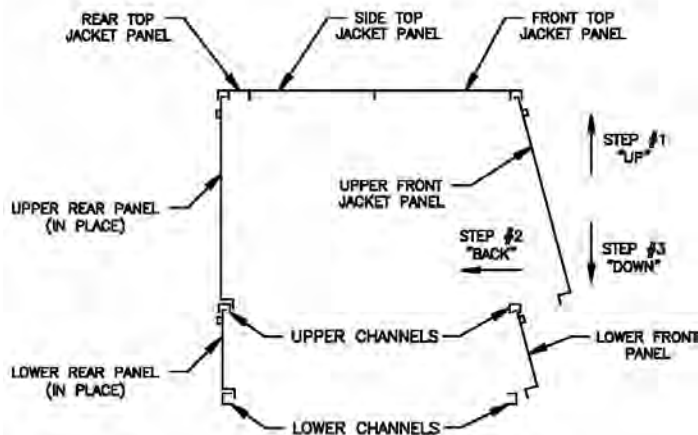


FIG. 59
REMOVAL OF JACKET FRONT PANEL

CARE SHOULD BE EXERCISED IN REMOVING THE CLEANOUT PLATES FROM THE BOLTS SO THAT THE INSULATION IS NOT DAMAGED. IF DAMAGED, ALL EDGES OF THE CLEANOUT PLATES SHOULD BE SEALED WITH BOILER PUTTY WHEN REINSTALLED UNTIL INSULATION CAN BE REPLACED.

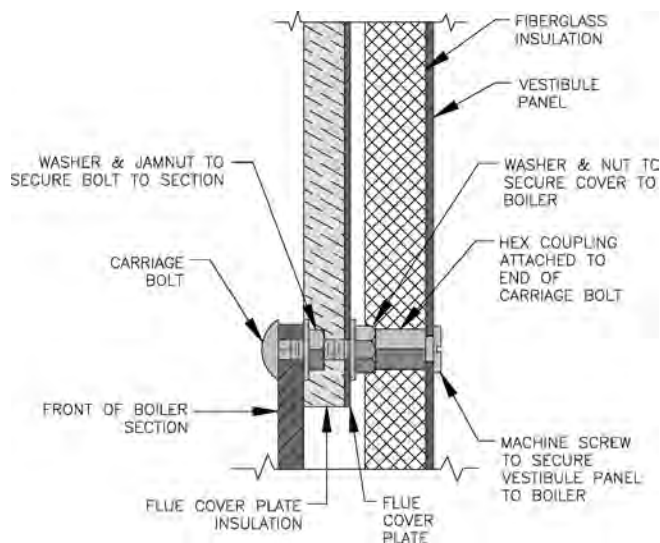


FIG. 60
ATTACHMENT OF FLUE COVERS

Using a flashlight, examine all flue passageways. If passageways are free of soot and obstructions, it is not necessary to remove the rear cleanout panels. Remove the Burner Access Panels at front of base and place paper or cardboard over burners. With long handle wire flue brush and vacuum, brush flueways thoroughly through front and rear cleanout openings – see Fig. 61. Remove material placed over burners and vacuum the following with care so as not to disturb base insulation: floor, top of burners, primary air opening in burners, and primary air openings in pilot. This will remove any dust or lint that may have accumulated as well as any foreign matter that may have been dislodged during the cleaning of the flues.

If Burners must be removed, use the following procedure:

- a. Mark location on manifold of all burners with pilots.
- b. Using a pair of pliers, remove hitch pin clips (shaped like a hairpin) from groove in main burner orifices. SAVE ALL CLIPS.
- c. Remove all burners without pilots by lifting front of burner slightly, then pushing burner toward rear of boiler until front of burner clears orifice, then lift rear of burner until head of weld pin on bottom rear of burner clears keyhole slot in base rear panel. Burner is now free and can be lifted out thru opening in base front frame.

Important Product Safety Information

Refractory Ceramic Fiber Product

Warning:

The Repair Parts list designates parts that contain refractory ceramic fibers (RCF). RCF has been classified as a possible human carcinogen. When exposed to temperatures about 1805°F, such as during direct flame contact, RCF changes into crystalline silica, a known carcinogen. When disturbed as a result of servicing or repair, these substances become airborne and, if inhaled, may be hazardous to your health.

AVOID Breathing Fiber Particulates and Dust

Precautionary Measures:

Do not remove or replace RCF parts or attempt any service or repair work involving RCF without wearing the following protective gear:

1. A National Institute for Occupational Safety and Health (NIOSH) approved respirator
 2. Long sleeved, loose fitting clothing
 3. Gloves
 4. Eye Protection
- Take steps to assure adequate ventilation.
 - Wash all exposed body areas gently with soap and water after contact.
 - Wash work clothes separately from other laundry and rinse washing machine after use to avoid contaminating other clothes.
 - Discard used RCF components by sealing in an airtight plastic bag. RCF and crystalline silica are not classified as hazardous wastes in the United States and Canada.

First Aid Procedures:

- If contact with eyes: Flush with water for at least 15 minutes. Seek immediate medical attention if irritation persists.
- If contact with skin: Wash affected area gently with soap and water. Seek immediate medical attention if irritation persists.
- If breathing difficulty develops: Leave the area and move to a location with clean fresh air. Seek immediate medical attention if breathing difficulties persist.
- Ingestion: Do not induce vomiting. Drink plenty of water. Seek immediate medical attention.

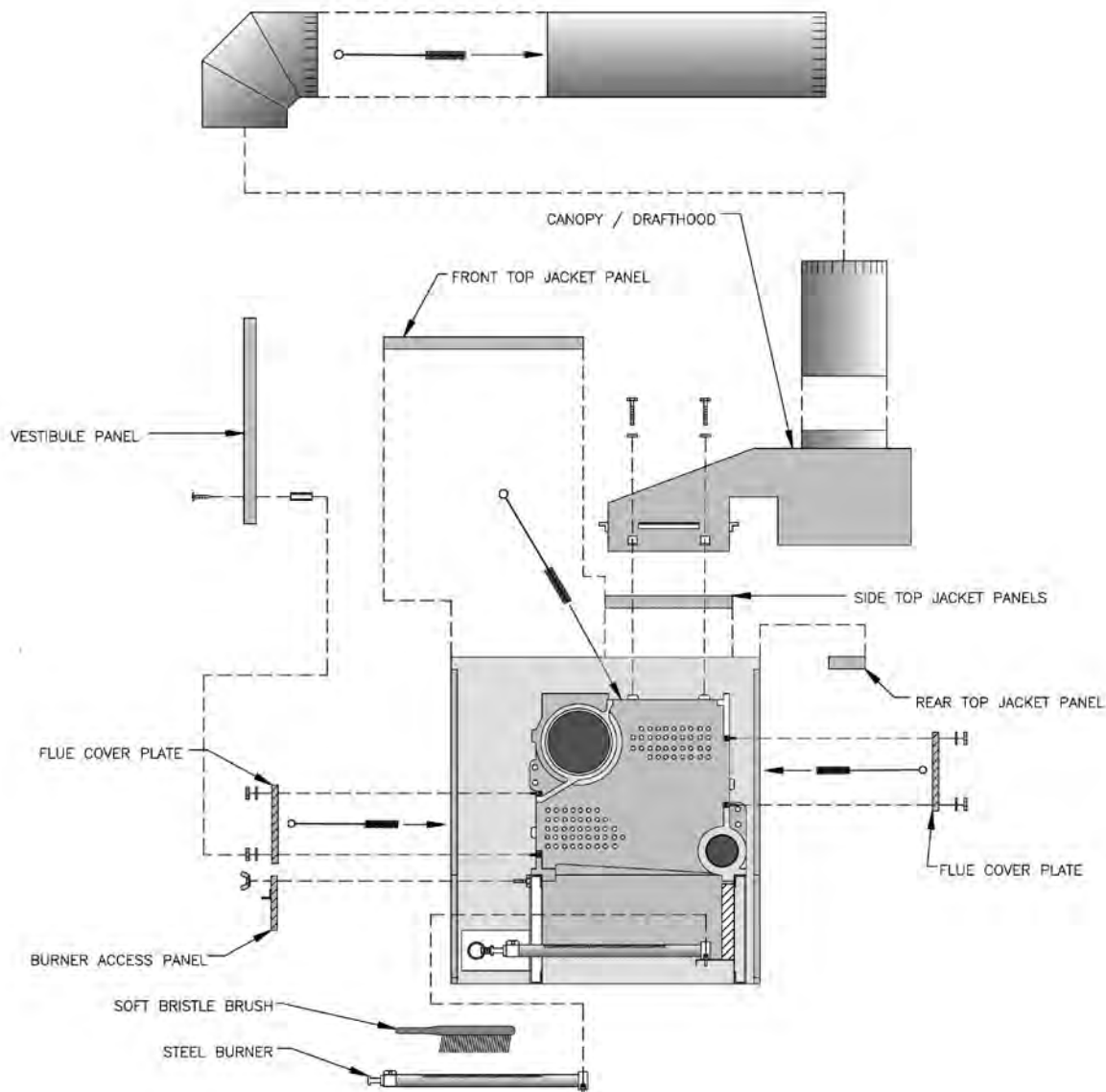


FIG. 61
CLEANING OF FLUEWAYS

- d. Remove all burners with pilots by first tracing all electrical leads coming from pilot to their points of connection, remove leads from terminals to which they are connected, and then tag each lead with respective terminal designation. Disconnect Pilot Tubing at nearest connection to pilot and remove burner as outlined in paragraph c. above.
- e. When replacing burners, reverse procedure used in removal of burners. Make sure burners are secure in keyhole slots in base rear panel and hitch pin clips are installed in grooves in all main burner orifices. Burners with pilots must be in same locations as original installation. If markings placed on manifold (when burners were removed) are obliterated, see Fig. 62. Reconnect electrical leads and reconnect pilot tubing.

Reinstall Flue Cleanout Plates so that they are gas tight. Reinstall Burner Access Panels and Jacket Panels.

4. LUBRICATION

Manufacturers Instruction should be followed on all parts installed on the boiler that require lubrication. Generally this involves only the circulator in a hot water system. This includes:

- (a) Type of lubricant to be used
- (b) Frequency of lubrication
- (c) Points to lubricate

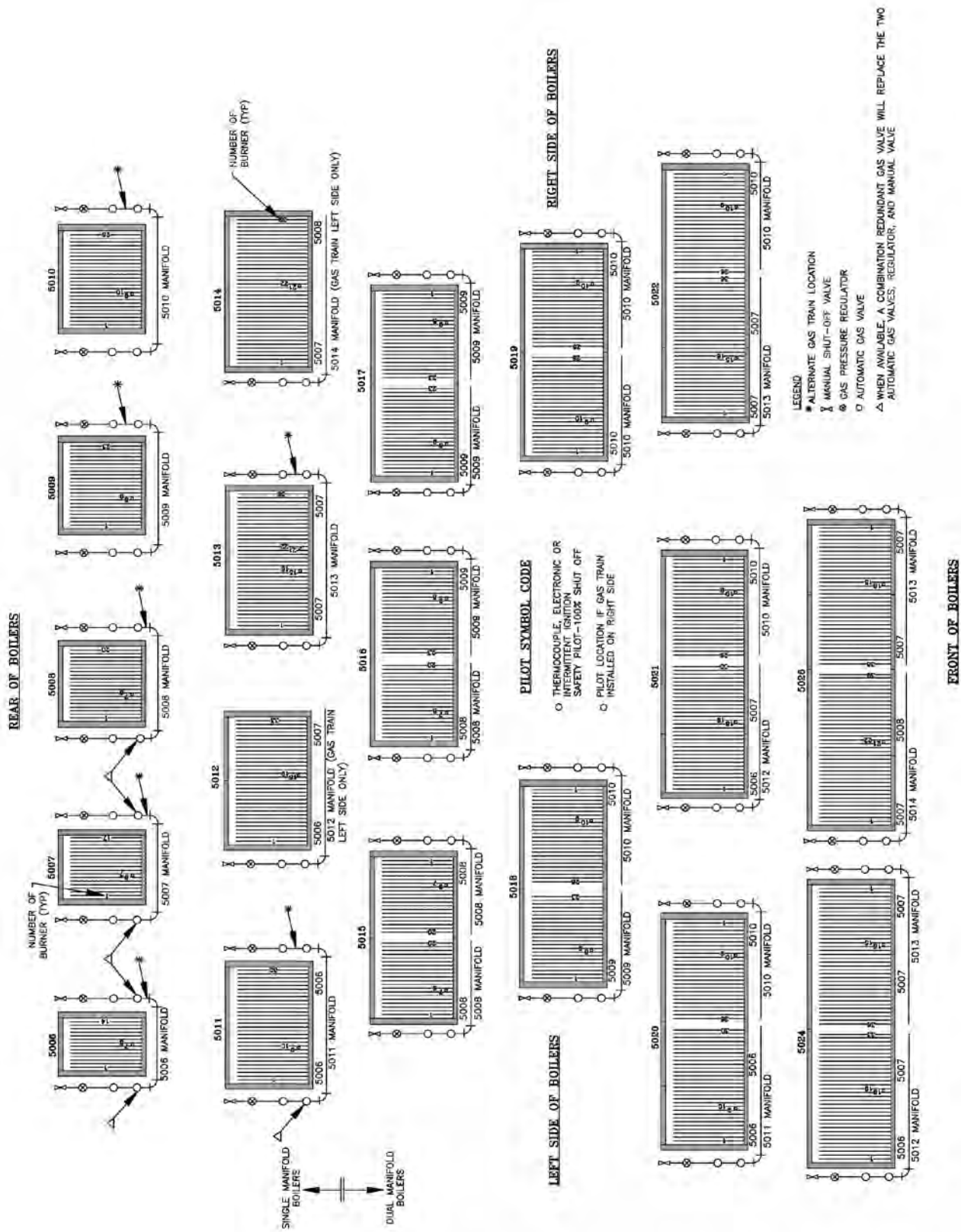


FIG. 62
PILOT LOCATIONS

5. MAIN BURNER FLAMES –

Main Burner Flames should be checked at initial start-up, annually thereafter, or after flueway cleaning, or after an extended shutdown period. Main Burner Flame should have a clearly defined inner cone, see Fig. 63, with no yellow tipping. Orange-yellow streaks caused by dust should not be confused with true yellow tipping.

Yellow-tipping indicates a lack of primary air and normally can be corrected by opening the air shutter. Improper alignment of burner on orifice will also affect primary air injection.

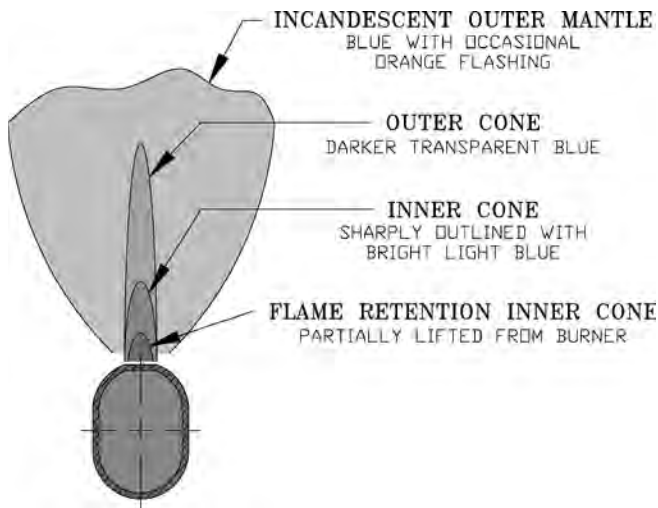


FIG. 63
MAIN BURNER FLAME ADJUSTMENT

6. PILOT FLAME –

Pilot Flame should be checked at initial start-up, annually thereafter, or after flueway cleaning, or after an extended shutdown period.

The EI Control System utilizes a Honeywell Q3481B pilot. Flame should be adjusted by means of the pilot line regulator 5.5" WC pilot line press so that a medium hard center flame envelopes approximately 3/8" of the end of the sensing probe, see Fig. 64. If flame is yellow, primary air slot may be covered with dirt or lint. This can be removed with a soft brush or by vacuuming.

- a. To adjust or check spark gap between electrode and hood on Honeywell Q3481B intermittent pilot. (See Fig. 64)

1. Use a round wire gauge to check spark gap.
2. Spark gap should be 0.1" for optimum performance.

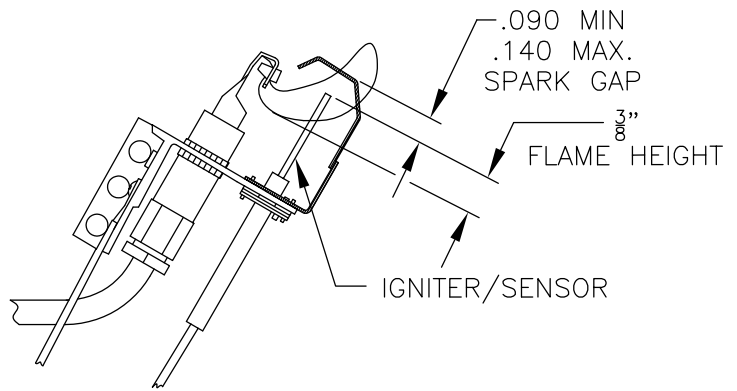


FIG. 64
PILOT FLAME - HONEYWELL Q3481B

The EO and EOP Control Systems utilize a Honeywell Q179D Flame Rectification Pilot to which a Q309 thermocouple has been added. Adjust pilot line regulator 5.5" WC in pilot line so that a medium hard center flame envelopes flame rod, see Fig. 65. If flame is yellow, primary air opening may be covered with dirt or lint. This can be removed with a soft brush or by vacuuming.

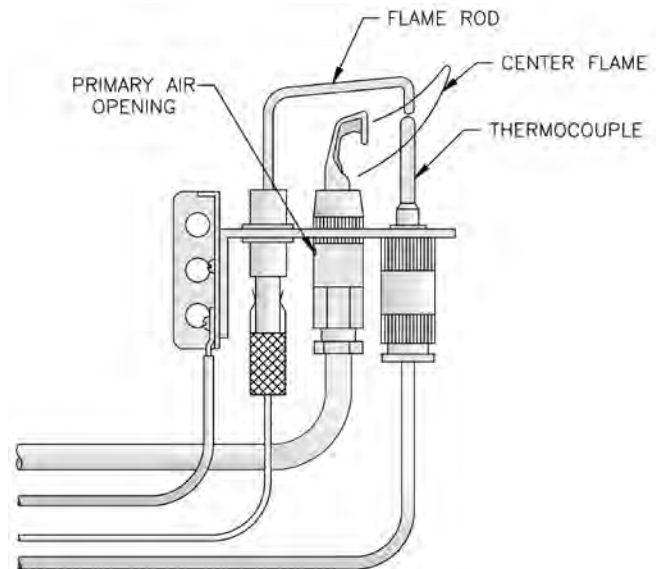


FIG. 65
PILOT FLAME
HONEYWELL Q179D PILOT W/THERMOCOUPLE

The EE and EEP Control Systems utilize a Honeywell Q179C Flame Rectification Pilot. Adjust pilot line regulator (5.5" WC in pilot line) so that a medium hard center flame envelops flame rod, see Fig. 66. If flame is yellow, primary air opening may be covered with dirt or lint. This can be removed with a soft brush or by vacuuming.

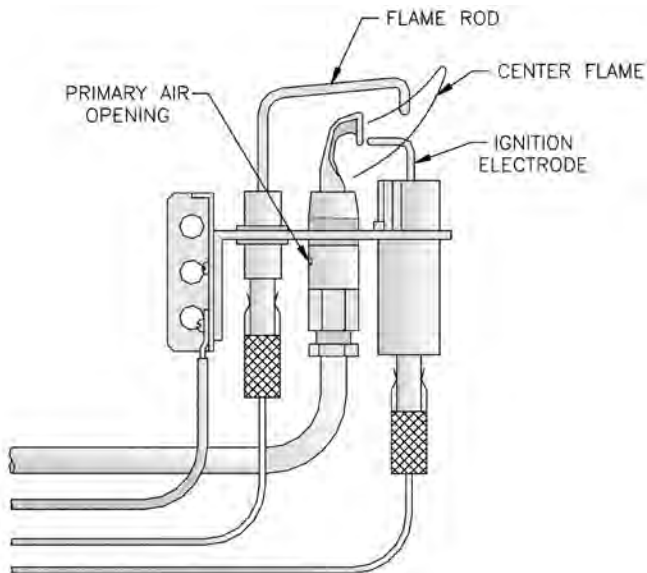


FIG. 66
PILOT FLAME
HONEYWELL Q179C PILOT

The Thermocouple Control System utilizes a Honeywell Q327A non-primary aerated pilot with a Q309A thermocouple. Adjust pilot line regulator to give a steady flame enveloping 3/8" to 1/2" of the tip of the thermocouple, see Fig. 67.

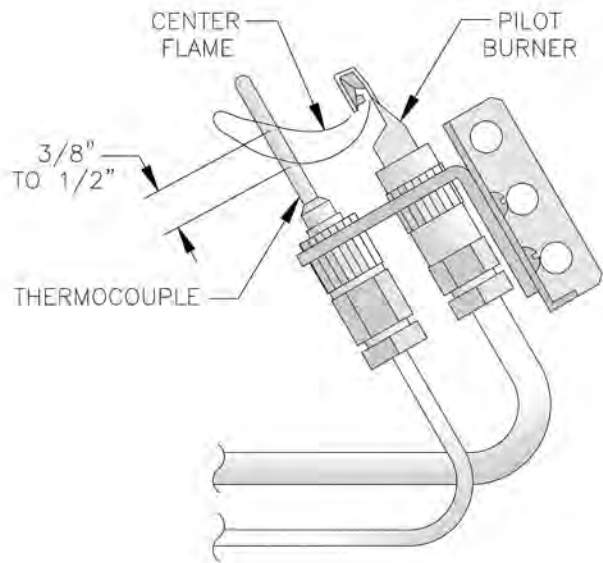


FIG. 67
PILOT FLAME
HONEYWELL Q327A PILOT W/THERMOCOUPLE

7. LOW WATER CUT-OFF —

a. Float Type Low Water Cut-off

During the heating season, if an external low water cut-off is on the boiler, the blow off valve should be opened once a month (use greater frequency where conditions warrant), to flush out the sediment chamber so the device will be free to function properly.

Low-water fuel cut-offs and water feeders should be dismantled annually by qualified personnel, to the extent necessary to insure freedom from obstructions and proper functioning of the working parts. Inspect connecting lines to boiler for accumulation of mud, scale, etc. and clean as required. Examine all visible wiring for brittle or worn insulation and make sure electrical contacts are clean and that they function properly. Give special attention to solder joints on bellows and float when this type of control is used. Check float for evidence of collapse and check mercury bulb (where applicable) for mercury separation or discoloration. *Do not attempt to repair mechanisms in the field.* Complete replacement mechanisms, including necessary gaskets and installation instructions, are available from the manufacturer.

IMPORTANT

Probe type low water cut-off devices require annual inspection and maintenance. Although these devices are solid state in their operation, the probe is exposed to possible contamination in the boiler water and subject to fouling.

Follow these Probe Low Water Cut-off instructions for complete, step-by-step probe inspection and cleaning instructions.

b. Probe Type Low Water Cut-off

It is important to physically remove the probe from the boiler tapping annually and inspect that probe for accumulation of scale or sediment. Follow these steps to inspect, clean, and/or replace the probe:

1. Turn off electric service to the boiler.
2. Turn off gas supply to the boiler.
3. Drain boiler water to a level below the tapping for the probe.

DANGER

Assure that the boiler is at zero pressure before removing the LWCO probe. Do not rely on the pressure gauge to indicate that the boiler is at zero pressure. Open the safety valve to relieve all internal pressure prior to proceeding. Safety valve discharge piping must be piped such that the potential for burns is eliminated.

4. Disconnect wiring connections between the low water cut-off control and the probe.
5. Dismount the low water cut-off control from the probe.
6. Unscrew the probe from the boiler tapping.
7. Inspect that portion of the probe that is exposed to the boiler water for a scale or sediment buildup.
8. Light deposits may be removed by wiping the probe with a damp cloth. Wiping the probe with a cloth soaked in vinegar will remove more tenacious lime deposits. The most stubborn deposits may be removed from the probe by using a diluted amount (3 parts of water to 1 part) of phosphoric acid (H_2PO_4).
9. Wire brushing of the probe is not recommended as the soft, platinum guard ring sandwiched between ceramic insulators may be damaged. Care must be taken not to damage this ring in any way or the useful life of the probe may be shortened.

10. Clean the pipe threads of the probe to remove old, hardened pipe dope and other foreign matter.
11. Apply a moderate amount of good quality pipe dope to the pipe threads on the probe, leaving the two end threads bare.
12. Screw the probe into the boiler tapping.
13. Mount the low water cut-off control on the probe.
14. Reconnect the control to probe wiring.
15. Fill the boiler to its normal waterline.
16. Restore gas supply to the boiler.
17. Remove the front door of the boiler and follow the lighting instructions posted on the vestibule panel.

WARNING

**Before returning boiler to service:
Follow this low water cut-off check out procedure:**

- Set thermostat to the highest setting.
- While boiler is operating, open drain valve and *slowly* drain down boiler water.

CAUTION

Do not drain water below gauge glass.

- Main burners should turn off when water level drops below low water cut-off. At this point the water level in gauge glass will just be visible.
- Be sure that it is the low water cut-off control and not the room thermostat, pressure cut-out or other control that has shut off the burners.
- Refill the boiler to the normal water level.
- Main burners should reignite.
- Clean out the boiler according to the instructions for steam boilers on page 43.
- Reset controls for normal operation.

IMPORTANT

If, during normal operation, it is necessary to add water to this boiler more frequently than once a month, consult a qualified service technician to check your system for leaks. A leaky system will increase the volume of make-up water supplied to the boiler which can significantly shorten a life of the boiler. Entrained in make-up water are dissolved minerals and oxygen. When the fresh, cool make-up water is heated in the boiler the minerals fall out as sediment and the oxygen escapes as a gas. Both can result in reduced boiler life. The accumulation of sediment can eventually isolate the water from contacting the cast iron. When this happens the cast iron in that area gets extremely hot and eventually cracks. The presence of free oxygen in the boiler creates a corrosive atmosphere which, if the concentration becomes high enough, can corrode the cast iron through from the inside. Since neither of these failure types are the result of a casting defect the warranty does not apply. Clearly it is in everyone's best interest to prevent this type of failure. The maintenance of system integrity is the best method to achieve this.

SECTION VI - REPAIR PARTS

REPAIR PARTS INDEX

ITEM	PAGE NOS.
Base Parts	83 thru 86
Integral Drafthoods & Sections.....	87 thru 89
Base/Pilot Assemblies	90
Jackets	91 thru 95
Gas Trains	96 thru 102
Support Brackets, Ignition Modules.....	103 thru 110
Pilotstats, Transformers, Pilot	
Solenoid Valves & Pilot Line	
Regulators	
EOP & EEP Control Panels.....	111
Pilot Assemblies	112 thru 114

All Series 5B Repair Parts may be obtained through your local Burnham Wholesale distributor. Should you require assistance in locating a Burnham Distributor in your area, or have questions regarding the availability of Burnham products or repair parts, please contact Burnham Customer Service at (717) 481-8400 or Fax (717) 481-8408.

TABLE 2A
SERIES 5B BASE PARTS - 5006B thru 5014B
 Number in () in Table Relates to Corresponding Number in  in Figure 68

PART NUMBER	ITEM	PART SIZE	BOILER SIZE									
			5006B	5007B	5008B	5009B	5010B	5011B	5012B	5013B	5014B	
7181301	High Base End Panel	12-1/2 x 25-3/4	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	
7201319	High Base End Panel Insul. - 1" Supertemp	12 x 21-1/2	(2)	(2)	(2)	(2)	(2)	(2)	(2)	(2)	(2)	
80861551	Cup Head Pin CL #10 x 1-5/8"		(3)	(3)	(3)	(3)	(3)	(3)	(3)	(3)	(3)	
80861503	Speed Clip 1-1/4" x 1-1/8" SS Type 304		(4)	(4)	(4)	(4)	(4)	(4)	(4)	(4)	(4)	
61813061	5006B Base Front and Rear Frame Assembly	12-1/2 x 27-3/16	(5)				(5) & (6)	(5)	(5) & (6)	(5)	(5)	
61813071	5007B Base Front and Rear Frame Assembly	12-1/2 x 32-5/8		(5)				(6)				
61813081	5008B Base Front and Rear Frame Assembly	12-1/2 x 38-1/16			(5)							
61813091	5009B Base Front and Rear Frame Assembly	12-1/2 x 43-1/2				(5)						
61813101	5010B Base Front and Rear Frame Assembly	12-1/2 x 48-15/16					(5)					
80861601	Burner Access Panel Attaching Screw		(7)	(7)	(7)	(7)	(7)	(7)	(7)	(7)	(7)	
6181301	Base Spacer Assembly	11 x 22-3/4						(8)	(8)	(8)	(8)	
71813062	5006B Base Rear Panel	9-5/8 x 26-15/16	(9)									
71813072	5007B Base Rear Panel	9-5/8 x 32-3/8		(9)								
71813082	5008B Base Rear Panel	9-5/8 x 37-13/16			(9)							
71813092	5009B Base Rear Panel	9-5/8 x 43-1/4				(9)						
71813102	5010B Base Rear Panel	9-5/8 x 48-11/16					(9)					
71813112	5011B Base Rear Panel	9-5/8 x 54-1/8						(9)				
71813122	5012B Base Rear Panel	9-5/8 x 59-9/16							(9)			
71813132	5013B Base Rear Panel	9-5/8 x 65								(9)		
71813142	5014B Base Rear Panel	9-5/8 x 70-7/16									(9)	
72013065	Base Rear Panel Insulation - 1" Supertemp	8-3/4 x 26-15/16	(11) 1 pc									
72013075	Base Rear Panel Insulation - 1" Supertemp	8-3/4 x 32-3/8		(11) 1 pc								
72013085	Base Rear Panel Insulation - 1" Supertemp	8-3/4 x 38-7/8			(11) 2 pcs							
72013095	Base Rear Panel Insulation - 1" Supertemp	8-3/4 x 43-1/2				(11) 2 pcs						
72013105	Base Rear Panel Insulation - 1" Supertemp	8-3/4 x 48-11/16					(11) 2 pcs					
72013115	Base Rear Panel Insulation - 1" Supertemp	8-3/4 x 53-1/2						(11) 2 pcs				
72013125	Base Rear Panel Insulation - 1" Supertemp	8-3/4 x 58-1/2							(11) 2 pcs			
7181312	Front Int. Panel Support Bracket							(13)	(13)	(13)	(13)	
7181313	Lower Rear Int. Panel Support Bracket							(14)	(14)	(14)	(14)	
7181302	Low Base End Panel	11-7/8 x 25-3/4	(15)	(15)	(15)	(15)	(15)	(15)	(15)	(15)	V	
7201320	Low Base End Panel Insul. - 1" Supertemp	11-3/8 x 21-1/2	(16)	(16)	(16)	(16)	(16)	(16)	(16)	(16)	(16)	
8221306	5006B Manifold	1-1/2 Pipe x 34-5/16	(17)									
8221307	5007B Manifold			(17)								
8221308	5008B Manifold				(17)							
8221309	5009B Manifold					(17)						
8221310	5010B Manifold						(17)					
8221311	5011B Manifold							(17)				
8221312	5012B Manifold								(17)			
8221313	5013B Manifold									(17)		
8221314	5014B Manifold										(17)	
8231301	Main Burners without Pilot Bracket		(18)	(18)	(18)	(18)	(18)	(18)	(18)	(18)	(18)	
8231302	Or Main Burners w/J991 Pilot Bracket (EI Controls)		(19)	(19)	(19)	(19)	(19)	(19)	(19)	(19)	(19)	
8231303	Or Main Burners w/Q179 Pilot Bkt (EO, EOP, EP, EEP Controls)		(20)	(20)	(20)	(20)	(20)	(20)	(20)	(20)	(20)	
8231304	Or Main Burners w/Q327 Pilot Bkt (Thermocouple Controls)		(21)	(21)	(21)	(21)	(21)	(21)	(21)	(21)	(21)	
822628	Main Gas Orifices (Nat. Gas) - #40 Drill		(22)	(22)	(22)	(22)	(22)	(22)	(22)	(22)	(22)	
822629	Or Main Gas Orifices (LP) - #55 Drill		(23)	(23)	(23)	(23)	(23)	(23)	(23)	(23)	(23)	
822604	Hitch Pin Clip		(24)	(24)	(24)	(24)	(24)	(24)	(24)	(24)	(24)	
61813062	5006B Burner Access Panel Assembly	7-1/4 x 26-15/16	(25)				(25) & (26)	(25)	(25) & (26)	(25)	(25)	
61813072	5007B Burner Access Panel Assembly	7-1/4 x 32-3/8		(25)				(26)			(26)	
61813082	5008B Burner Access Panel Assembly	7-1/4 x 37-13/16			(25)							
61813092	5009B Burner Access Panel Assembly	7-1/4 x 43-1/4				(25)						
61813102	5010B Burner Access Panel Assembly	7-1/4 x 48-11/16	(12)	(12)	(12)	(12)	(12)	(12)	(12)	(12)	(12)	
7186001	Observation Hole Cover		(10)	(10)	(10)	(10)	(10)	(10)	(10)	(10)	(10)	
80860900	1/4 - 20 Wing Nut											
8201303	Low Base End to Right Section Fiberglass Rope	3/4 X 25-3/4										

TABLE 2B
SERIES 5B BASE PARTS - 5015B thru 5026B
 Number in () in Table Relates to Corresponding Number in Figure 69

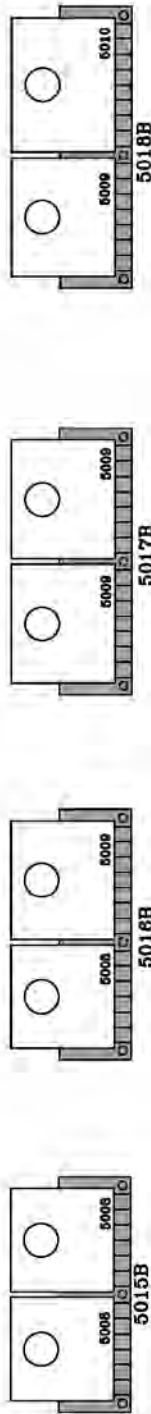
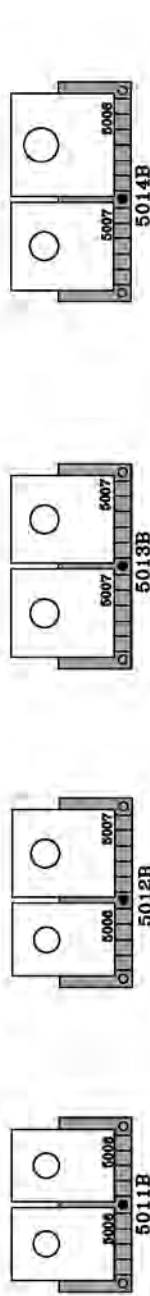
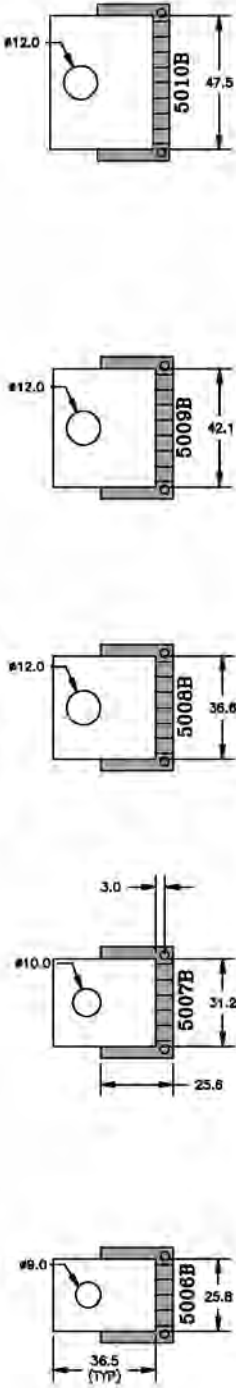
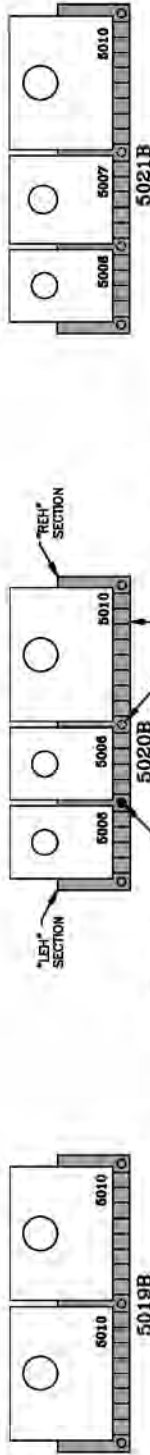
PART NUMBER	ITEM	PART SIZE	BOILER SIZE									
			5015B	5016B	5017B	5018B	5019B	5020B	5021B	5022B	5024B	5026B
7181301	High Base End Panel	12-1/2 x 25-3/4	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)
7201319	High Base End Panel Insul. - 1" Thick	12 x 21-1/2	(2)	(2)	(2)	(2)	(2)	(2)	(2)	(2)	(2)	(2)
80861551	Cup Head Pin CL #10 x 1-5/8"		(3)	(3)	(3)	(3)	(3)	(3)	(3)	(3)	(3)	(3)
80861503	Speed Clip 1-1/4" x 1-1/8" SS Type 304		(4)	(4)	(4)	(4)	(4)	(4)	(4)	(4)	(4)	(4)
61813061	5006B Base Front and Rear Frame Assembly	12-1/2 x 27-3/16						(5) & (6)	(5)	(5)	(5)	(5)
61813071	5007B Base Front and Rear Frame Assembly	12-1/2 x 32-5/8							(6)	(5) & (6)	(6), (30) & (31)	(5), (30) & (31)
61813081	5008B Base Front and Rear Frame Assembly	12-1/2 x 38-1/16	(5) & (6)	(5)								(6)
61813091	5009B Base Front and Rear Frame Assembly	12-1/2 x 43-1/2					(5) & (6)	(30)	(30)	(30)		
61813101	5010B Base Front and Rear Frame Assembly	12-1/2 x 48-15/16					(6)	(7)	(7)	(7)	(7)	(7)
80861601	Burner Access Panel Attaching Screw						(8)	(8)	(8)	(8)	(8)	(8)
6181301	Base Spacer Assembly	11 x 22-3/4					(7)					
71813082	5008B Base Rear Panel	9-5/8 x 37-13/16	(8)	(8)	(8)	(8)	(9)					
71813092	5009B Base Rear Panel	9-5/8 x 43-1/4	(9) & (32)	(32)	(9) & (32)	(9)						
71813102	5010B Base Rear Panel	9-5/8 x 48-11/16				(32)	(9) & (32)	(32)	(32)	(32)		
71813112	5011B Base Rear Panel	9-5/8 x 54-1/8						(9)				
71813122	5012B Base Rear Panel	9-5/8 x 59-9/16							(9)			
71813132	5013B Base Rear Panel	9-5/8 x 65								(9)	(32)	(32)
71813142	5014B Base Rear Panel	9-5/8 x 70-7/16									(32)	(9)
72013065	Base Rear Panel Insulation - 1" Thick	8-3/4 x 26-15/16						(11) 2 pcs		(11) 2 pcs	(11) 2 pcs	(11) 2 pcs
72013075	Base Rear Panel Insulation - 1" Thick	8-3/4 x 32-3/8										
72013085	Base Rear Panel Insulation - 1" Thick	8-3/4 x 18-7/8	(11) 4 pcs	(11) 2 pcs	(11) 4 pcs	(11) 2 pcs						
72013095	Base Rear Panel Insulation - 1" Thick	8-3/4 x 21-5/8	(11) 2 pcs	(11) 2 pcs	(11) 2 pcs	(11) 2 pcs	(11) 2 pcs	(11) 2 pcs	(11) 2 pcs	(11) 2 pcs	(11) 2 pcs	(11) 2 pcs
72013105	Base Rear Panel Insulation - 1" Thick	8-3/4 x 24-5/16										
72013115	Base Rear Panel Insulation - 1" Thick	8-3/4 x 29-3/4										
72013125	Base Rear Panel Insulation - 1" Thick	8-3/4 x 35-3/16										
7181312	Front Int. Panel Support Bracket		(13)	(13)	(13)	(13)	(13)	(13)	(13)	(13)	(13)	(13)
7181313	Lower Rear Int. Panel Support Bracket		(14)	(14)	(14)	(14)	(14)	(14)	(14)	(14)	(14)	(14)
7181302	Low Base End Panel	11-7/8 x 25-3/4	(15)	(15)	(15)	(15)	(15)	(15)	(15)	(15)	(15)	(15)
7201320	Low Base End Panel Insul. - 1" Thick	11-3/8 x 21-1/2	(16)	(16)	(16)	(16)	(16)	(16)	(16)	(16)	(16)	(16)
8221308	5008B Manifold	1-1/2 Pipe x 45-3/16	(17) & (29)	(17)	(17 & 29)	(17)						
8221309	5009B Manifold	1-1/2 Pipe x 50-5/8	(29)	(29)	(17 & 29)	(17)						
8221310	5010B Manifold	1-1/2 Pipe x 56-1/6				(29)	(17) & (29)	(29)	(29)	(29)		
8221311	5011B Manifold	1-1/2 Pipe x 61-1/2						(17)				
8221312	5012B Manifold	1-1/2 Pipe x 66-15/16							(17)			
8821313	5013B Manifold	1-1/2 Pipe x 72-3/8								(17)	(29)	(29)
8221314	5014B Manifold	1-1/2 Pipe x 77-13/16									(29)	(17)
8231301	Main Burners without Pilot Bracket		(18)	(18)	(18)	(18)	(18)	(18)	(18)	(18)	(18)	(18)
8231302	Or Main Burners w/J991 Pilot Bracket (EI Controls)		(19)	(19)	(19)	(19)	(19)	(19)	(19)	(19)	(19)	(19)
8231303	Or Main Burners w/Q179 Pilot Bkt (EO, EOP, EP, EEP Controls)		(20)	(20)	(20)	(20)	(20)	(20)	(20)	(20)	(20)	(20)
8231304	Or Main Burners w/Q327 Pilot Bkt (Thermocouple Controls)		(21)	(21)	(21)	(21)	(21)	(21)	(21)	(21)	(21)	(21)
822628	Main Gas Orifices (Nat. Gas) - #40 Drill		(22)	(22)	(22)	(22)	(22)	(22)	(22)	(22)	(22)	(22)
822629	Or Main Gas Orifices (LP) - #55 Drill		(23)	(23)	(23)	(23)	(23)	(23)	(23)	(23)	(23)	(23)
822604	Hitch Pin Clip		(24)	(24)	(24)	(24)	(24)	(24)	(24)	(24)	(24)	(24)
61813062	5006B Burner Access Panel Assembly	7-1/4 x 26-15/16	(25)				(25) & (26)	(25) & (26)	(25)	(25) & (26)	(26), (27) & (28)	(25), (27) & (28)
61813072	5007B Burner Access Panel Assembly	7-1/4 x 32-3/8		(25)					(26)	(25) & (26)	(26)	(26)
61813082	5008B Burner Access Panel Assembly	7-1/4 x 37-13/16	(25) & (26)	(25)	(25)							
61813092	5009B Burner Access Panel Assembly	7-1/4 x 43-1/4		(26)	(25) & (26)	(25)						
61813102	5010B Burner Access Panel Assembly	7-1/4 x 48-11/16	(12)	(12)	(12)	(12)	(25) & (26)	(27)	(27)	(27)	(12)	(12)
7186001	Observation Hole Cover		(10)	(10)	(10)	(10)	(10)	(10)	(10)	(10)	(10)	(10)
80860900	1/4 - 20 Wing Nut											



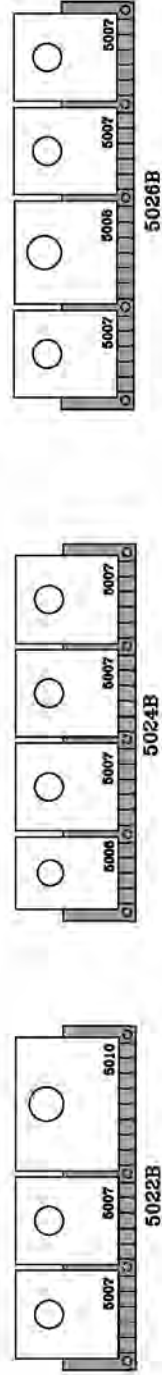
TABLE 3A

SERIES 5B INTEGRAL CANOPY DRAFTHOODS - BOILER SIZES

PART SIZE	PART NO.	Canopy - Drafthood No.	BOILER SIZE (QUANTITY)				
			5006B	5007B	5008B	5009B	5010B
36-1/2 X 25-3/4	61113063	5006B (1)	1				
36-1/2 X 31-3/16	61113073	5007B (2)		1			
36-1/2 X 36-5/8	61113083	5008B (3)			1		
36-1/2 X 41-1/16	61113093	5009B (4)				1	
36-1/2 X 47-1/2	61113103	5010B (5)					1
			5011B	5012B	5013B	5014B	5015B
36-1/2 X 25-3/4	61113063	5006B (1)	2	1			
36-1/2 X 31-3/16	61113073	5007B (2)		1	2	1	
36-1/2 X 36-5/8	61113083	5008B (3)				1	2
36-1/2 X 41-1/16	61113093	5009B (4)					
36-1/2 X 47-1/2	61113103	5010B (5)					
			5016B	5017B	5018B	5019B	5020B
36-1/2 X 25-3/4	61113063	5006B (1)					3
36-1/2 X 31-3/16	61113073	5007B (2)					
36-1/2 X 36-5/8	61113083	5008B (3)	1				
36-1/2 X 41-1/16	61113093	5009B (4)	1	2	1		
36-1/2 X 47-1/2	61113103	5010B (5)			1	2	1
			5021B	5022B	5024B	5026B	
36-1/2 X 25-3/4	61113063	5006B (1)	1		1		
36-1/2 X 31-3/16	61113073	5007B (2)	1	2	3	3	
36-1/2 X 36-5/8	61113083	5008B (3)				1	
36-1/2 X 41-1/16	61113093	5009B (4)					
36-1/2 X 47-1/2	61113103	5010B (5)	1	1			

REAR OF BOILERSLEFT SIDE OF BOILERSRIGHT SIDE OF BOILERS

*"CX" CENTER SECTION (TAPPED & PLUGGED)
 *"CX" CENTER SECTION (NOT TAPPED)
 *"CX" CENTER SECTION - PLAN (NOT TAPPED)

FRONT OF BOILERS

- SUPPLY & RETURN ON RIGHT & LEFT END SECTIONS NOT PLUGGED.
- SUPPLY & RETURN ON CENTER SECTION NOT PLUGGED.
- SUPPLY & RETURN ON CENTER SECTION PLUGGED.

1. THE NUMBERS ON THE CANOPIES INDICATE CANOPY SIZE.

FIG. 70
 INTEGRAL CANOPY DRAFTHOODS & SECTIONS

TABLE 3B
SERIES 5B SECTION REPLACEMENT CHART

PART NO.	ITEM	BOILER SIZE (QUANTITY)																		
		5006B	5007B	5008B	5009B	5010B	5011B	5012B	5013B	5014B	5015B	5016B	5017B	5018B	5019B	5020B	5021B	5022B	5024B	5026B
7171301	LEH Section	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)
7171303	C Center Section Plain	(4)	(5)	(6)	(7)	(8)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(16)	(17)	(18)	(19)	(21)
7171302	REH Section	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)
7171304	CX Center Section Tapped - Not Plugged										(1)	(1)	(1)	(1)	(1)	(1)	(2)	(2)	(3)	(3)
6171301	CXP Center Section Tapped - Plugged						(1)	(1)	(1)	(1)						(1)				
806600023	Nipple Gauge, 3" & 7"	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)
8056254	Nipple Lubricant, Loctite® #592, 50 ml	(3)	(3)					(1)	(1)	(2)	(2)	(3)	(3)					(1)	(2)	(3)
8056255	Nipple Lubricant, Loctite® #592, 250 ml			(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(2)	(2)	(2)	(2)	(2)	(2)	(2)

TABLE 3C

SERIES 5B BASE / PILOT ASSEMBLIES

5006B THRU 5014B BOILERS - SINGLE BASE REQUIRED											
(NATURAL GAS)											
	5006B	5007B	5008B	5009B	5010B	5011B	5012B	5013B	5014B		
Complete Base Ass'y w/El Pilot Ass'y	618130642	618130742	618130842	618130942	618131042	618131142	618131242	618131342	618131442		
Complete Base Ass'y w/EO-EOP Pilot Ass'y	61813067	61813077	61813087	61813097	61813107	61813117	61813127	61813137	61813147		
Complete Base Ass'y w/EE-EOP Pilot Ass'y	618130611	618130711	618130811	618130911	618131011	618131111	618131211	618131311	618131411		
Complete Base Ass'y w/Thermocouple Pilot Ass'y	618130651	618130751	618130851	618130951	618131051	618131151	618131251	618131351	618131451		
(LP GAS)											
Complete Base Ass'y w/EO-EOP Pilot Ass'y	61813069	61813079	61813089	61813099	61813109	61813119	61813129	61813139	61813149		
Complete Base Ass'y w/EE-EOP Pilot Ass'y	618130631	618130731	618130831	618130931	618131031	618131131	618131231	618131331	618131431		
Complete Base Ass'y w/Thermocouple Pilot Ass'y	618130661	618130761	618130861	618130961	618131061	618131161	618131261	618131361	618131461		
(NATURAL GAS)											
Right Base Subass'y w/El Pilot Ass'y	5015B	5016B	5017B	5108B	5109B	5020B	5021B	5022B	5024B	5026B	
Right Base Subass'y w/EO-EOP Pilot Ass'y	618130852	618130952	618131052	618131052	618130952	618131052	618131052	618131052	618131352	618131352	
Right Base Subass'y w/EE-EOP Pilot Ass'y	61813088	61813098	61813098	61813108	61813108	61813108	61813108	61813108	61813138	61813138	
Right Base Subass'y w/EE-EOP Pilot Ass'y	618130821	618130921	618130921	618131021	618131021	618131021	618131021	618131021	618131321	618131321	
Right Base Subass'y w/Thermocouple Pilot Ass'y	618130871	618130971	618130971	618131071	618131071	618131071	618131071	618131071	618131371	618131371	
Left Base Subass'y w/El Pilot Ass'y	618131541	618131641	618131741	618131841	618131941	618132041	618132141	618131052	618131352	618131352	
Left Base Subass'y w/EO-EOP Pilot Ass'y	61813155	61813165	61813175	61813185	61813195	61813205	61813215	61813225	61813245	61813265	
Left Base Subass'y w/EE-EOP Pilot Ass'y	61813157	61813167	61813177	61813187	61813197	61813207	61813217	61813227	61813247	61813267	
Left Base Subass'y w/Thermocouple Pilot Ass'y	61813159	61813169	61813179	61813189	61813199	61813209	61813219	61813229	61813249	61813269	
(LP GAS)											
Right Base Subass'y w/EO-EOP Pilot Ass'y	618130801	618130901	618130901	618131001	618131001	618131001	618131001	618131001	618131301	618131301	
Right Base Subass'y w/EE-EOP Pilot Ass'y	618130841	618130941	618130941	618131041	618131041	618131041	618131041	618131041	618131341	618131341	
Right Base Subass'y w/Thermocouple Pilot Ass'y	618130881	618130971	618130971	618131071	618131071	618131071	618131071	618131071	618131371	618131371	
Left Base Subass'y w/EO-EOP Pilot Ass'y	61813156	61813166	61813176	61813186	61813196	61813206	61813216	61813226	61813246	61813266	
Left Base Subass'y w/EE-EOP Pilot Ass'y	61813158	61813168	61813178	61813188	61813198	61813208	61813218	61813228	61813248	61813268	
Left Base Subass'y w/Thermocouple Pilot Ass'y	618131511	618131611	618131711	618131811	618131911	618132011	618132111	618132211	618132411	618132611	

TABLE 4A
SERIES 5B JACKETS
Number in () in Table Relates to Corresponding Number in  in Figure 71

PART NUM- BER	ITEM	PART SIZE	BOILER SIZE									
			5006B	5007B	5008B	5009B	5010B	5011B	5012B	5013B	5014B	5015B
60413059	*5005B Front Top Panel	17-1/2 x 28-5/8						(1) & (2)	(1)			
60413069	5006B Front Top Panel	17-1/2 x 34-1/16	(1)						(2)	(1) & (2)	(1)	
60413079	5007B Front Top Panel	17-1/2 x 39-1/2		(1)								
60413089	5008B Front Top Panel	17-1/2 x 44-15/16			(1)							
60413099	5009B Front Top Panel	17-1/2 x 50-3/8				(1)						
60413109	5010B Front Top Panel	17-1/2 x 55-13/16					(1)					
7041316	Front Top Int. Panel	6-1/16 x 12						(9)	(9)	(9)	(9)	(9)
6041327	Center Top Int. Panel	6-1/16 x 6-7/8						(47)	(47)	(47)	(27)	(47)
6041328	Rear Top Int. Panel	3-25/32 x 6-1/16						(10)	(10)	(10)	(10)	(10)
60413052	*5005B Upper Rear Panel	24-1/2 x 26-5/16						(23) & (24)	(24)			
60413062	5006B Upper Rear Panel	24-1/2 x 31-3/4	(23)						(23)	(23) & (24)	(23)	(23) & (24)
60413072	5007B Upper Rear Panel	24-1/2 x 37-3/16		(23)							(24)	
60413082	5008B Upper Rear Panel	24-1/2 x 42-5/8			(23)							
60413092	5009B Upper Rear Panel	24-1/2 x 48-1/16				(23)						
60413102	5010B Upper Rear Panel	24-1/2 x 53-1/2					(23)					
60413053	*5005B Lower Rear Panel	9-1/2 x 26-5/16						(27) & (28)	(27)			
60413063	5006B Lower Rear Panel	9-1/2 x 31-3/4	(27)						(28)	(27) & (28)	(27)	
60413073	5007B Lower Rear Panel	9-1/2 x 37-3/16		(27)								
60413083	5008B Lower Rear Panel	9-1/2 x 42-5/8			(27)							
60413093	5009B Lower Rear Panel	9-1/2 x 48-1/16				(27)						
60413103	5010B Lower Rear Panel	9-1/2 x 53-1/2					(27)					
60413021	Upper Rear Int. Panel	7-5/16 x 25-1/2						(31)	(31)	(31)	(31)	(31)
60413031	Lower Rear Int. Panel	7-5/16 x 10-1/2						(32)	(32)	(32)	(32)	(32)
6041329	Upper Left End Panel	36 x 26	(13)	(13)	(13)	(13)	(13)	(13)	(13)	(13)	(13)	(13)
60413071	Lower Left End Panel	36 x 10-1/2	(14)	(14)	(14)	(14)	(14)	(14)	(14)	(14)	(14)	(14)
70413054	*5005B Upper Front Panel	24-1/2 x 26-5/16						(33) & (34)	(33)			
70413064	5006B Upper Front Panel	24-1/2 x 31-3/4	(33)						(34)	(33) & (34)	(33)	(33) & (34)
70413074	5007B Upper Front Panel	24-1/2 x 37-6/16		(33)							(34)	
70413084	5008B Upper Front Panel	24-1/2 x 42-5/8			(33)							
70413094	5009B Upper Front Panel	24-1/2 x 48-1/16				(33)						
70413104	5010B Upper Front Panel	24-1/2 x 53-1/2					(33)					
* For Multiple Usage Only												

Number in () in Table Relates to Corresponding Number in **O** in Figure 71

[illegible]

TABLE 4C
SERIES 5B JACKETS
Number in () in Table Relates to Corresponding Number in  in Figure 71

PART NUM- BER	ITEM	PART SIZE	BOILER SIZE								
			5016B	5017B	5018B	5019B	5020B	5021B	5022B	5024B	5026B
60413049	*5004B Front Top Panel	17-1/2 x 23-3/16					(2)				
60413059	*5005B Front Top Panel	17-1/2 x 28-5/8					(1)	(1) & (2)	(2)	(1), (2) & (3)	(3)
60413069	5006B Front Top Panel	17-1/2 x 34-1/16							(1)	(4)	(1), (2) & (4)
60413079	5007B Front Top Panel	17-1/2 x 39-1/2	(1)								
60413089	5008B Front Top Panel	17-1/2 x 44-15/16	(2)	(1) & (2)	(1)						
60413099	5009B Front Top Panel	17-1/2 x 50-3/8			(2)	(1) & (2)	(3)	(3)			
60413109	5010B Front Top Panel	17-1/2 x 55-13/16									
7041316	Front Top Int. Panel	6-1/16 x 12	(9)	(9)	(9)	(9)	(9)	(9)	(9)	(9)	(9)
6041327	Center Top Int. Panel	6-1/6 x 6-7/8	(47)	(47)	(47)	(47)	(47)	(47)	(47)	(47)	(47)
6041328	Rear Top Int. Panel	3-25/32 x 6-1/16	(10)	(10)	(10)	(10)	(10)	(10)	(10)	(10)	(10)
60413042	*5004B Upper Rear Panel	24-1/2 x 20-7/8					(24)				
60413052	*5005B Upper Rear Panel	24-1/2 x 26-5/16					(23)	(23) & (24)	(24)	(23), (24) & (25)	(25)
60413062	5006B Upper Rear Panel	24-1/2 x 31-3/4						(23)	(23)	(26)	(23), (24) & (26)
60413072	5007B Upper Rear Panel	24-1/2 x 37-3/16	(23)								
60413082	5008B Upper Rear Panel	24-1/2 x 42-5/8	(24)	(23) & (24)	(23)	(23)					
60413092	5009B Upper Rear Panel	24-1/2 x 48-1/16			(24)	(23) & (24)	(25)	(25)			
60413043	*5004B Lower Rear Panel	9-1/2 x 20-7/8		(5)			(28)				
60413053	*5005B Lower Rear Panel	9-1/2 x 26-5/16			(5)		(27)	(27) & (28)	(28)	(27), (28) & (29)	(29)
60413063	5006B Lower Rear Panel	9-1/2 x 31-3/4				(5)		(27)	(27)	(30)	(27), (28) & (30)
60413073	5007B Lower Rear Panel	9-1/2 x 37-3/16	(27)								
60413083	5008B Lower Rear Panel	9-1/2 x 48-1/16	(28)	(27) & (28)	(27)						
60413093	5009B Lower Rear Panel	9-1/2 x 48-1/16		(28)	(28)	(27) & (28)	(29)	(29)			
6041333	Right Side Top Panel	3-7/8 x 14-13/16	(12)	(12)	(12)	(12)	(12)	(12)	(12)	(12)	(12)
60413021	Upper Rear Int. Panel	7-5/16 x 25-1/2	(31)	(31)	(31)	(31)	(31)	(31)	(31)	(31)	(31)
60413031	Lower Rear Int. Panel	7-5/16 x 10-1/2	(32)	(32)	(32)	(32)	(32)	(32)	(32)	(32)	(32)
6041329	Upper Left End Panel	36 x 26	(13)	(13)	(13)	(13)	(13)	(13)	(13)	(13)	(13)
60413071	Lower Left End Panel	36 x 10-1/2	(14)	(14)	(14)	(14)	(14)	(14)	(14)	(14)	(14)
70413044	*5004B Upper Front Panel	24-1/2 x 20-7/8					(34)				
70413054	*5005B Upper Front Panel	24-1/2 x 26-5/16					(33)	(33) & (34)	(34)	(33), (34) & (35)	(35)
70413064	5006B Upper Front Panel	24-1/2 x 31-3/4						(33)	(33)	(37)	(33), (34) & (36)
70413074	5007B Upper Front Panel	24-1/2 x 37-6/16	(33)								
70413084	5008B Upper Front Panel	24-1/2 x 48-1/16		(34)	(34)	(33) & (34)	(35)	(35)	(35)		
For Multiple Usage Only											

* For Multiple Usage Only

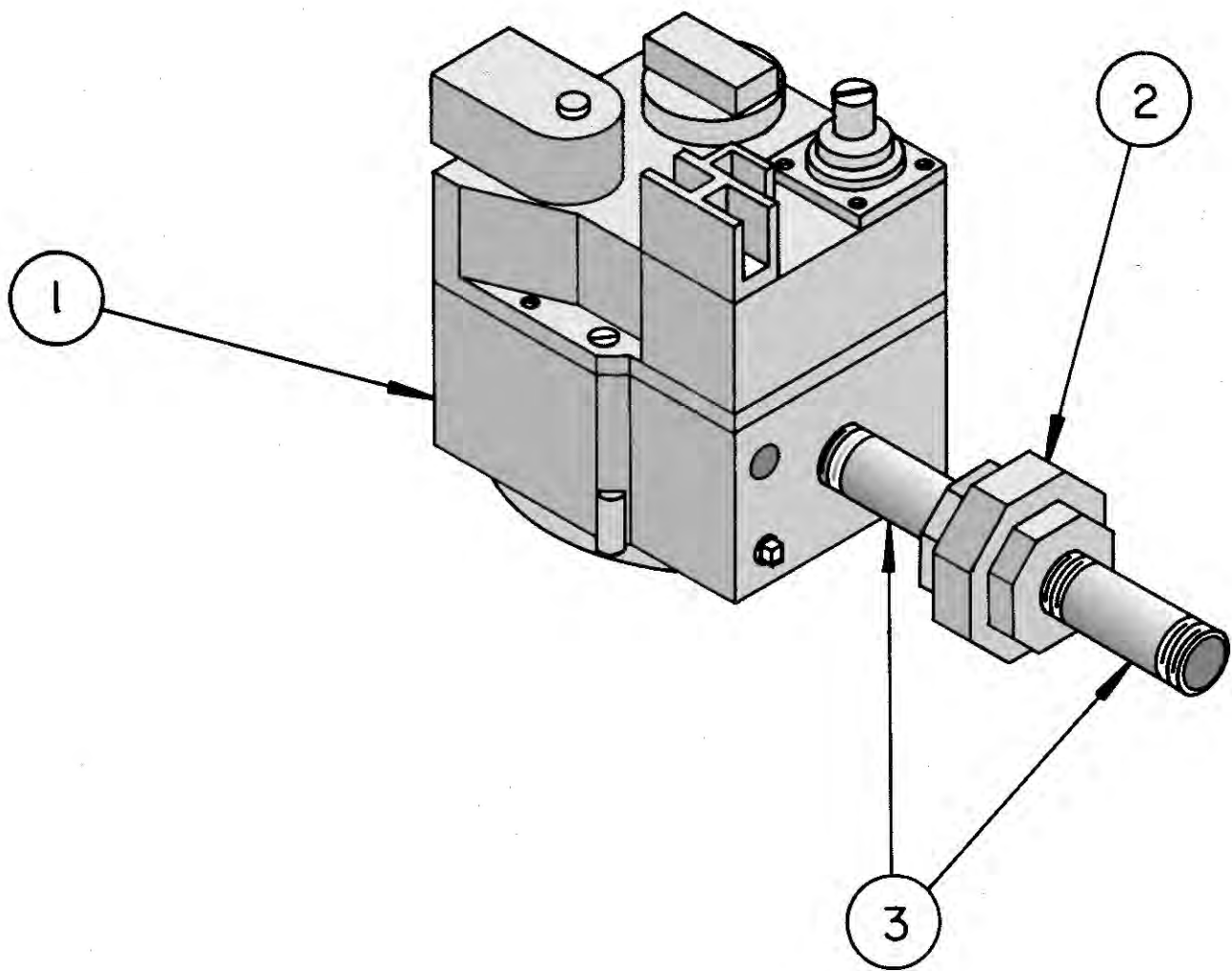
TABLE 4D

○

BOILER SIZE

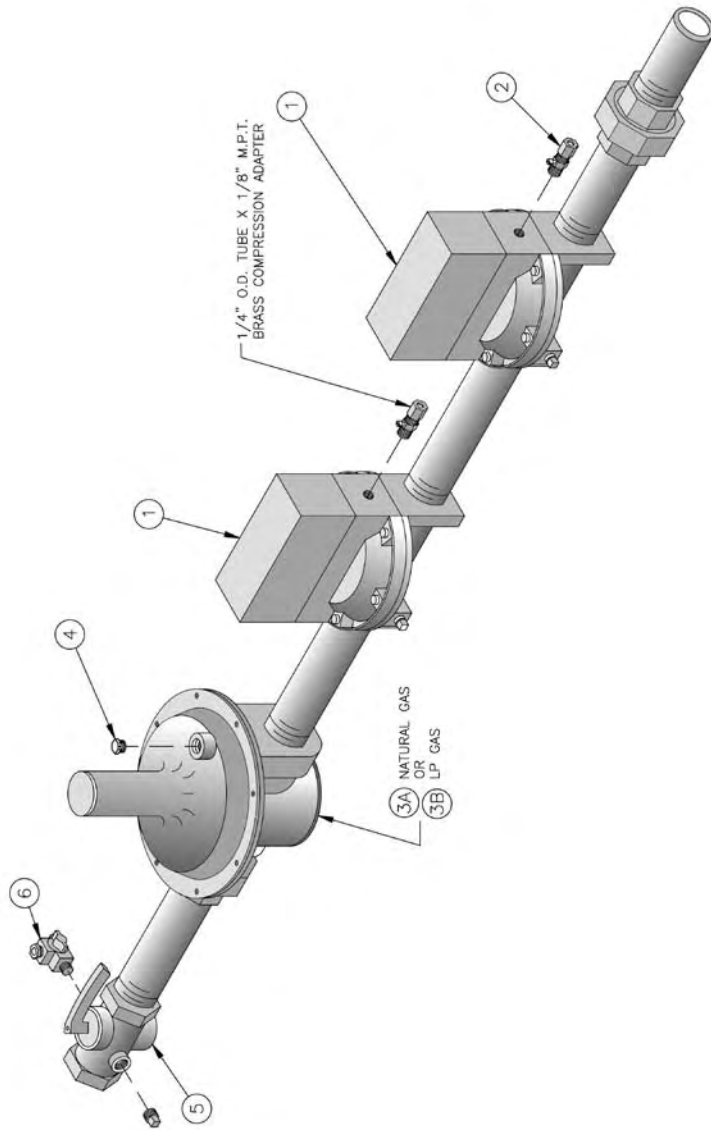
TABLE 4E COMPLETE JACKETS

1
2
3
4
5



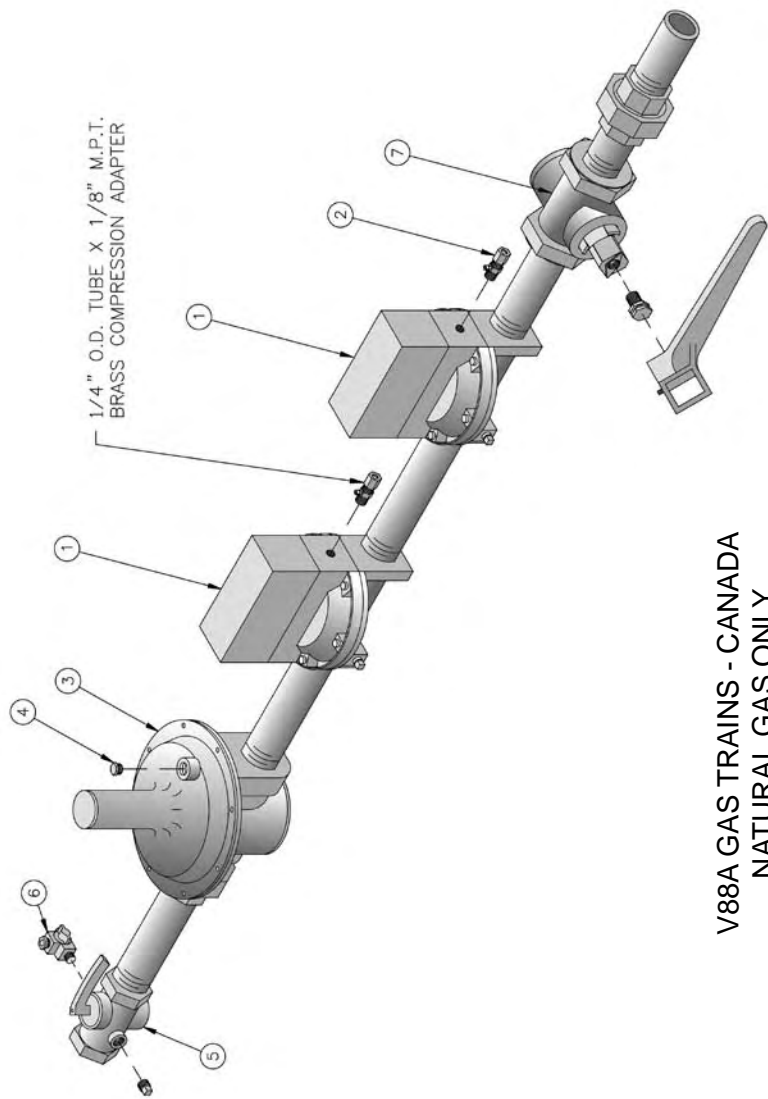
7000DERHC GAS TRAIN - EI - 5006B THRU 5009B - USA

PART NO.	ITEM	BOILER SIZE			
		5006B	5007B	5008B	5009B
81660151	Robertshaw 7000DERHC-S7C 1" x 1" Gas Valve (Nat.)	(1)	(1)	(1)	(1)
-- OR --					
81660158	Robertshaw 7000DERHC-LP-S7C 1" x 1" Gas Valve (LP)	(1)	(1)	(1)	(1)
806604002	1" Ground Joint Union	(2)	(2)	(2)	(2)
806600027	1" x 3" Lg. -- Nipple	(3)	(3)	(3)	(3)



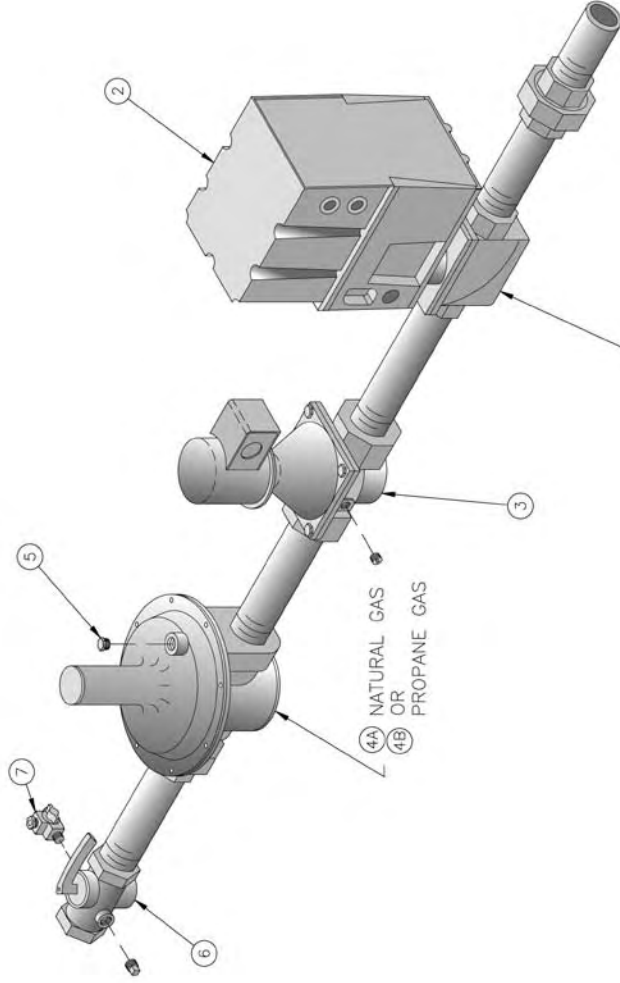
V88A GAS TRAINS - USA

PART NO.	ITEM	BOILER SIZE					
		5006B - 5008B	5009B - 5014B	5015B	5016B	5017B - 5026B	
81660008	Diaphragm Gas Valve						
81660009	1" Honeywell V88A1618	1	---	1	1	---	
822605	1 1/4" Honeywell V88A1626	---	1	---	1	1	
	Bleed Valve Assembly - Honeywell #126590	2	2	2	2	2	
	Nat. Gas Regulator - Std. Cad Plate Spring 3.0" x 6.0" WC						
8226006	Maxitrol RV-61 1" x 1"	3A	---	3A	3A	---	
822607	Maxitrol RV-81 1 1/4" x 1 1/4"	---	3A	---	3A	3A	
	LP Gas Regulator HO1 Blue Spring 5.5" to 12.0" WC						
8226011	Maxitrol RV-61 1" x 1"	3B	---	3B	3B	---	
8226012	Maxitrol RV-81 1 1/4" x 1 1/4"	---	3B	---	3B	3B	
822614	Leak Limiter - Maxitrol #12A04 (incl. w / RV-61)	4	---	4	4	---	
8226010	Leak Limiter - Maxitrol #12A34 (incl. w / RV-81)	---	4	---	4	4	
	Manual Shutoff Valve						
822615	ConBraCo 50-403-02 1" x 1"	5	---	5	5	---	
822616	ConBraCo 50-503-02 1 1/4" x 1 1/4"	---	5	---	5	5	
822645	Pilot Valve	6	6	6	6	6	



V88A GAS TRAINS - CANADA
NATURAL GAS ONLY

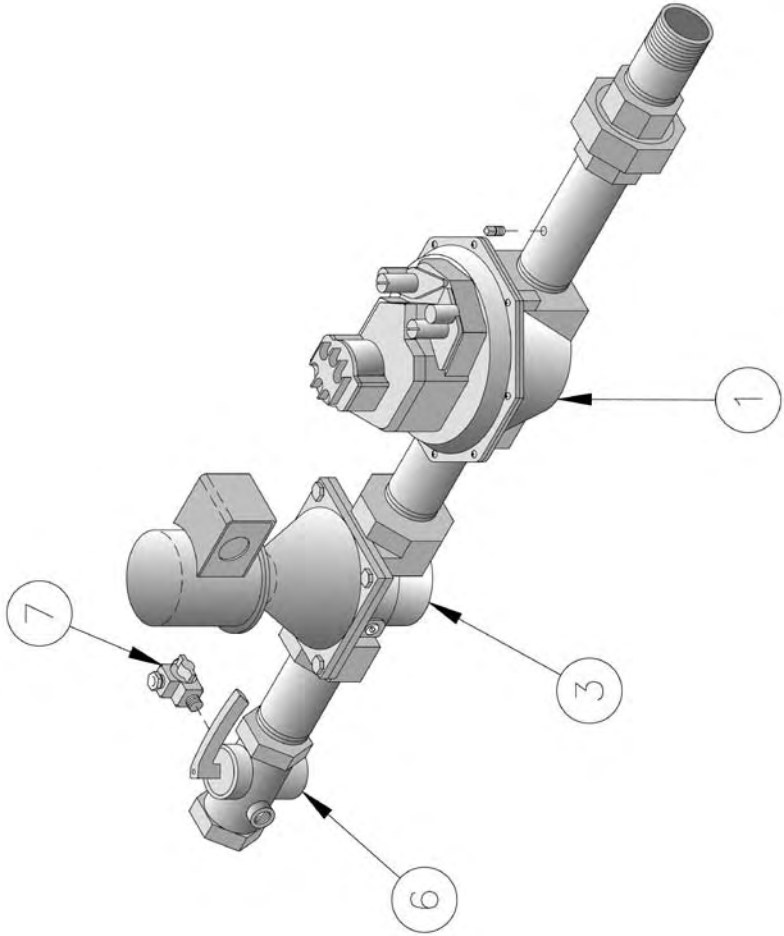
PART NO.	ITEM	BOILER SIZE						
		5006B - 5008B	5009B - 5014B	5015B	5016B	5017B - 5026B		
81660008	Diaphragm Gas Valve							
81660009	1" Honeywell V88A1618	1	---	1	1	---		
822605	1 1/4" Honeywell V88A1626	---	1	---	1	1		
	Bleed Valve Assembly - Honeywell #126590	2	2	2	2	2		
	Nat. Gas Regulator - Std. Cad Plate Spring 3.0" x 6.0" WC							
8226006	Maxitrol RV-61 1" x 1"	3	---	3	3	---		
822607	Maxitrol RV-81 1 1/4" x 1 1/4"	---	3	---	3	3		
822614	Leak Limiter - Maxitrol #12A04 (incl. w / RV-61)	4	---	4	4	---		
8226010	Leak Limiter - Maxitrol #12A34 (incl. w / RV-81)	---	4	---	4	4		
	Manual Shutoff Valve							
822615	ConBraCo 50-403-02 1" x 1"	5	---	5	5	---		
822616	ConBraCo 50-503-02 1 1/4" x 1 1/4"	---	5	---	5	5		
822645	Pilot Valve	6	6	6	6	6		
	Lubricated Plug Valve							
822619	Newman-Milliken 200M - 1"	7	---	7	7	---		
822620	Newman-Milliken 200M - 1 1/4"	---	7	---	7	7		



FLUID POWER GAS TRAINS - USA

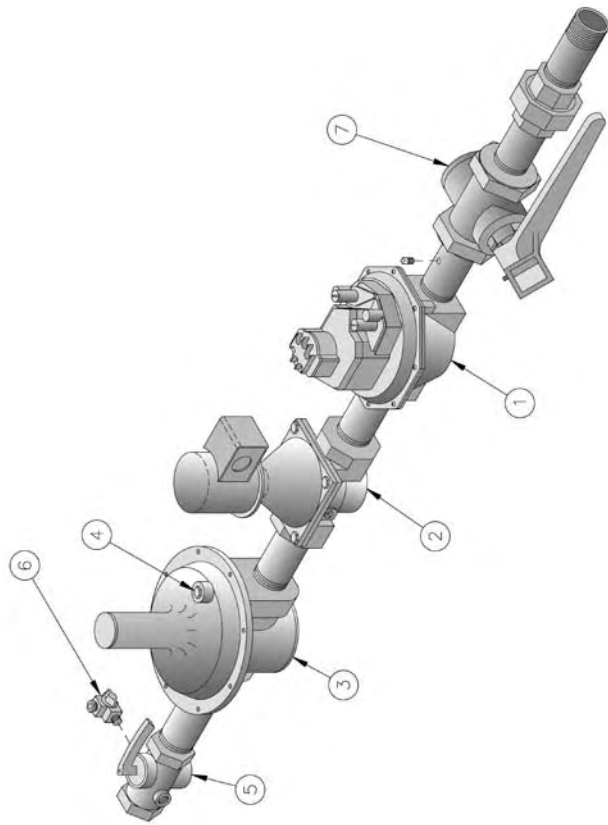
(See Page 100 for "LO-HI-LO" Natural Gas Diaphragm Type Valves)

PART NO.	ITEM	BOILER SIZE				
		5006B - 5008B	5009B - 5014B	5015B	5016B	5017B - 5026B
Fluid Power Gas Valve						
81660010	1" - Honeywell V5055B1002	1	---	1	1	---
81660011	1¼" - Honeywell V5055B1010	---	1	---	1	1
Actuators for Fluid Power Valves						
81660012	"Lo-Hi-Off" Honeywell V4055A1007 - 26 Sec. Opening Time - 120V 60HZ					
81660013	"Lo-Hi-Lo" Honeywell V4062A1008 - 26 Sec. Opening Time - 120V 60HZ					
81660014	"Modulating" Honeywell V9055A1055 - 26 Sec. Opening Time - 120V 60HZ					
Solenoid Gas Valve						
81660088	1" - ITT Gen. K3A562	3	---	3	3	---
81660086	1¼" - ITT Gen. K3A772	---	3	---	3	3
Nat. Gas Regulator - Std. Cad Plate Spring 3.0" x 6.0" WC						
82260006	Maxitrol RV-61 1" x 1"	4A	---	4A	4A	---
82260012	Maxitrol RV-81 1¼" x 1¼"	---	4A	---	4A	4A
LP Gas Regulator HO1 Blue Spring 5.5" to 12.0" WC						
8226011	Maxitrol RV-61 1" x 1"	4B	---	3B	3B	---
8226012	Maxitrol RV-81 1¼" x 1¼"	---	4B	---	4B	4B
822614	Leak Limiter - Maxitrol #12A04 (included w/ RV-61)	5	---	5	5	---
8226010	Leak Limiter - Maxitrol #12A34 (included w/ RV-81)	---	5	---	5	5
Manual Shutoff Valve						
822615	ConBraCo 50-403-02 1" x 1"	6	---	6	---	---
822616	ConBraCo 50-503-02 1¼" x 1¼"	---	6	---	6	6
822645	Pilot Valve	7	7	7	7	7



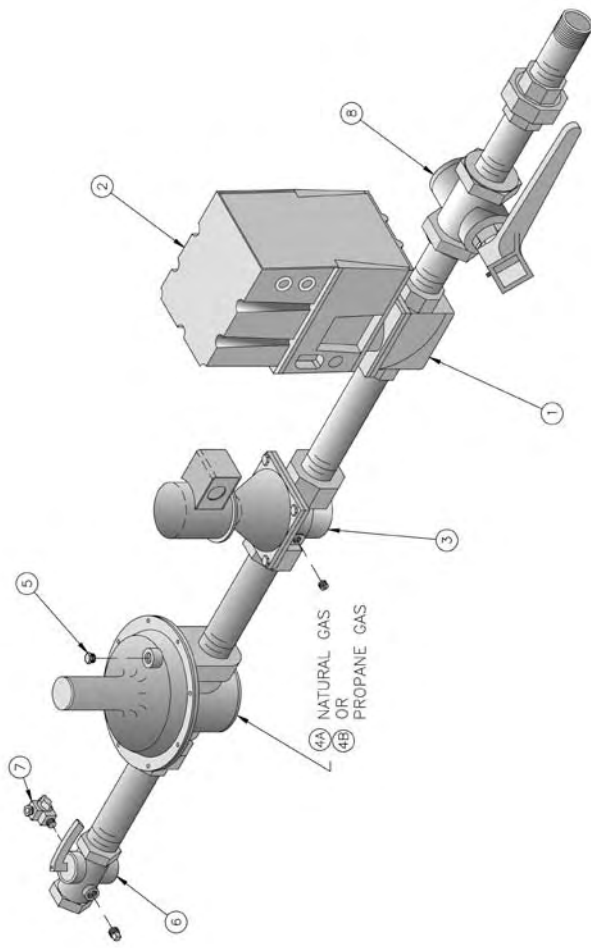
DIAPHRAGM VALVE "LO-HI-LO" GAS TRAIN
USA - NATURAL GAS ONLY

PART NO.	ITEM	BOILER SIZE				
		5006B	5009B	5015B	5016B	5017B
"Lo-Hi-Lo" Gas Valve						
81660149	1" Honeywell V8944B1019	1	---	1	1	---
81660150	1¼" Honeywell V8944B1027	---	1	---	1	1
Solenoid Gas Valve						
81660081	1" - ITT Gen. K8A461	3	---	3	3	---
81660094	1¼" - ITT Gen. K8A771	---	3	---	3	3
Manual Shutoff Valve						
822615	ConBraCo 50-403-02 1" x 1"	6	---	6	6	---
822616	ConBraCo 50-503-02 1¼" x 1¼"	---	6	---	6	6
822645	Pilot Valve	7	7	7	7	7



DIAPHRAGM VALVE "LO-HI-LO" GAS TRAIN
CANADA - NATURAL GAS ONLY

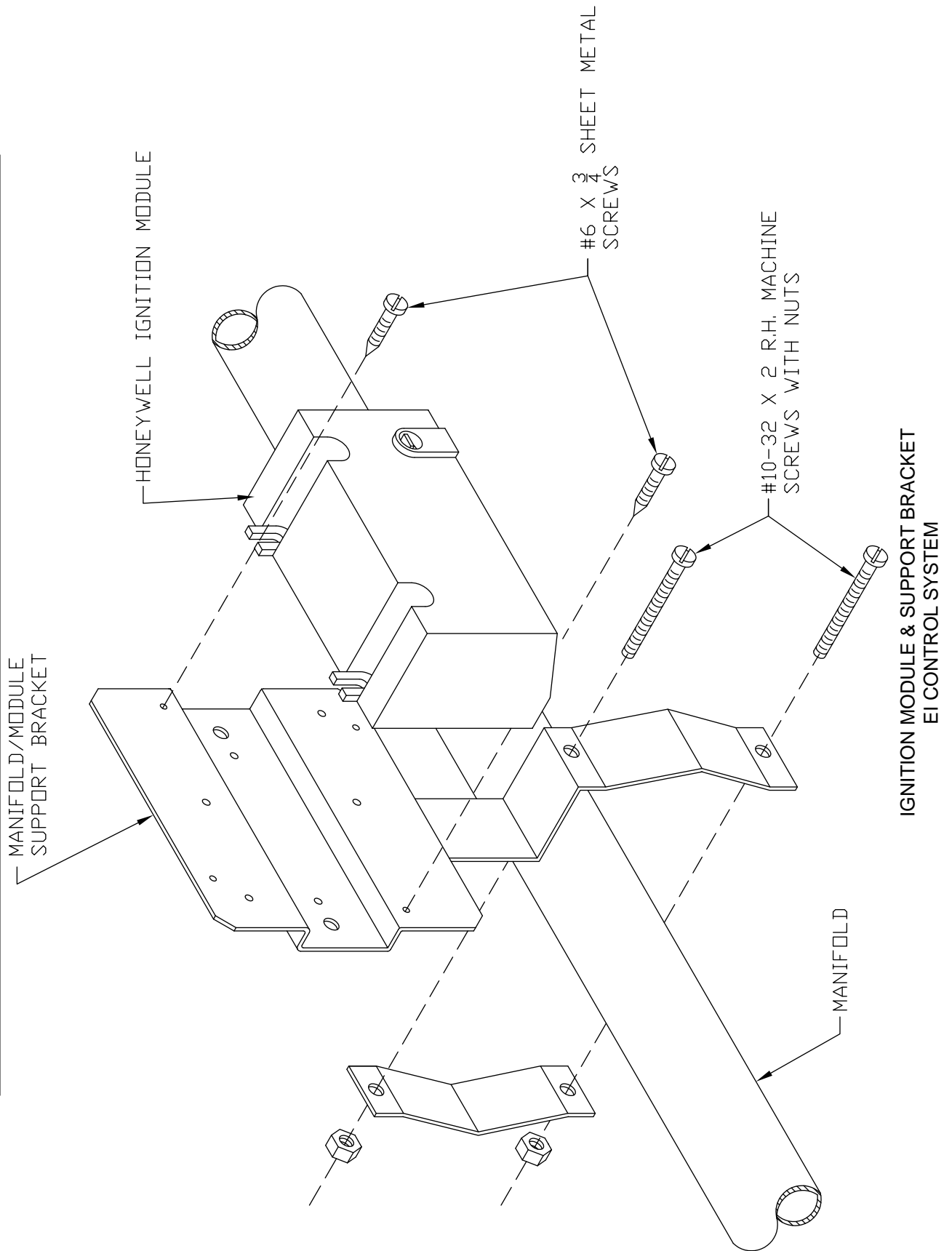
PART NO.	ITEM	BOILER SIZE			
		5006B - 5008B	5009B - 5014B	5015B	5016B 5017B - 5026B
81660149	"Lo-Hi-Lo" Gas Valve	1	---	1	---
81660150	1" Honeywell V8944B1019	---	1	---	1
	1 1/4" Honeywell V8944B1027	---	---	---	---
81660081	Solenoid Gas Valve	3	---	3	---
81660094	1" - ITT Gen. K8A461	---	3	---	3
	1 1/4" - ITT Gen. K8A771	---	---	---	---
8226006	Nat. Gas Regulator - Std. Cad Plate Spring 3.0" x 6.0" WC	3	---	3	---
8226012	Maxitrol RV-61 1" x 1"	---	3	---	3
	Maxitrol RV-81 1 1/4" x 1 1/4"	---	---	---	---
8226011	LP Gas Regulator HO1 Blue Spring 5.5" to 12.0" WC	3	---	3	---
8226012	Maxitrol RV-81 1 1/4" x 1 1/4"	---	3	---	3
	Leak Limiter	4	---	4	---
822614	Maxitrol #12A04 (included w/ RV-61)	---	4	---	---
8226010	Maxitrol #12A34 (included w/ RV-81)	---	---	---	---
	Manual Valve	5	---	5	---
822615	ConBraCo 50-403-02 1" x 1"	---	5	---	5
822616	ConBraCo 50-503-02 1 1/4" x 1 1/4"	---	---	---	---
	Pilot Valve	6	6	6	6
822645	1/8" MPT x 1/4" OD Tube	7	---	7	---
	Manual Valve	---	7	7	---
822619	Newman-Miliken 200M - 1"	---	---	---	---
822620	Newman-Miliken 200M - 1 1/4"	---	7	7	7



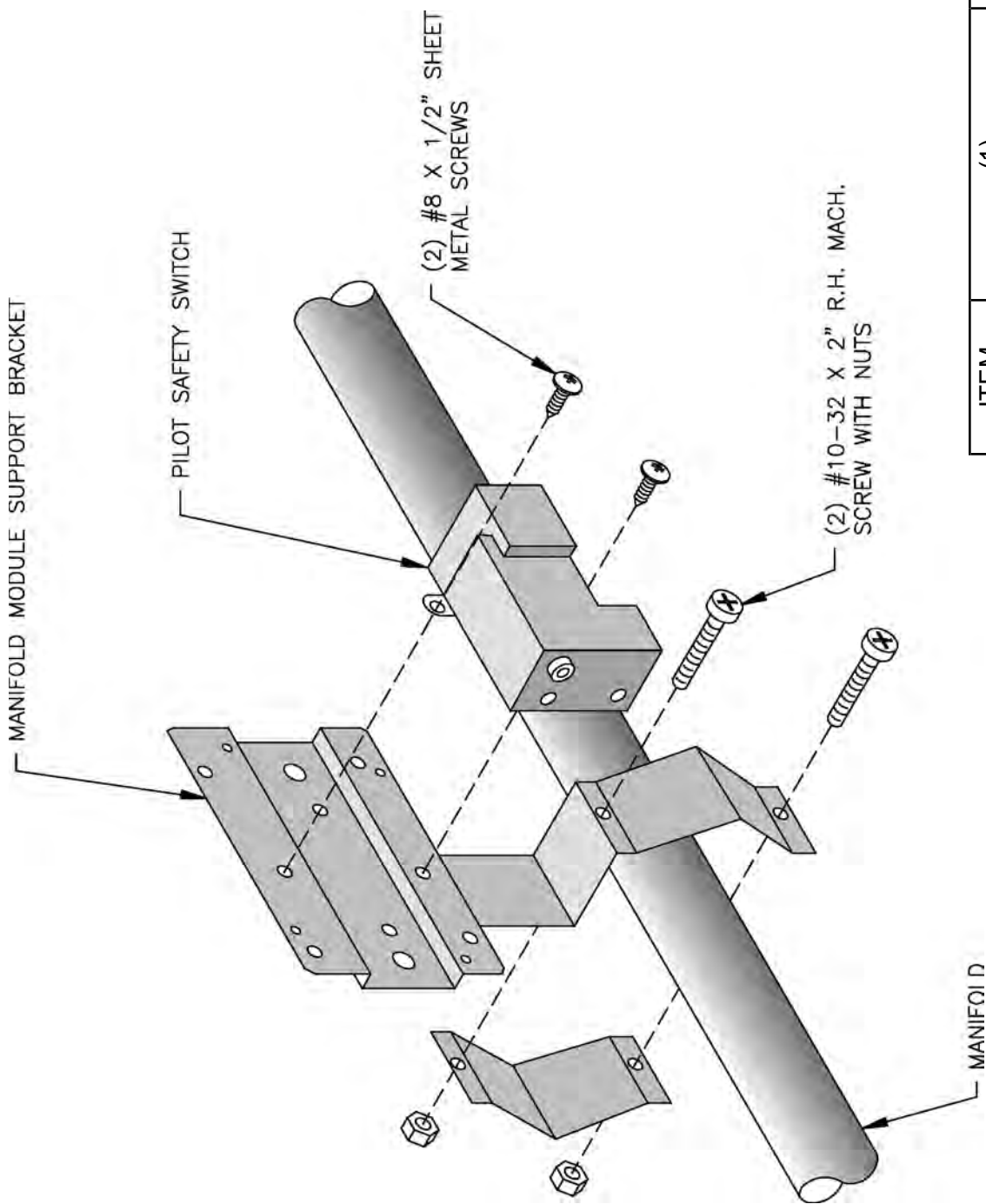
FLUID POWER GAS TRAINS - CANADA

PART NO.	ITEM	BOILER SIZE							
		5006B - 5008B	5009B - 5014B	5015B	5016B	5017B - 5026B			
81660010	Fluid Power Gas Valve								
81660011	1" - Honeywell V5055B1002	1	---	1	1	---			
	1 1/4" - Honeywell V5055B1010	---	1	---	1	1			
81660012	Actuators for Fluid Power Valves								
81660013	"Lo-Hi-Off" Honeywell V4055A1007 - 26 Sec. Opening Time - 120V 60HZ								
81660014	"Lo-Hi-Lo" Honeywell V4062A1008 - 26 Sec. Opening Time - 120V 60HZ - LP Only								
	"Modulating" Honeywell V9055A1055 - 26 Sec. Opening Time - 120V 60HZ								
81660088	Solenoid Gas Valve								
81660094	1" - ITT Gen. K3A562	3	---	3	3	---			
	1 1/4" - ITT Gen. K3A772	---	3	---	3	3			
8226006	Nat. Gas Regulator - Std. Cad Plate Spring 3.0" x 6.0" WC								
822607	Maxitrol RV-61 1" x 1"	4A	---	4A	4A	---			
	Maxitrol RV-81 1 1/4" x 1 1/4"	---	4A	---	4A	4A			
8226011	LP Gas Regulator HO1 Blue Spring 5.5" to 12.0" WC								
8226012	Maxitrol RV-61 1" x 1"	4B	---	3B	3B	---			
822614	Maxitrol RV-81 1 1/4" x 1 1/4"	---	4B	---	4B	4B			
8226010	Leak Limiter - Maxitrol #12A04 (included w/ RV-61)	5	---	5	5	---			
	Leak Limiter - Maxitrol #12A34 (included w/ RV-81)	---	5	---	5	5			
	Manual Shutoff Valve								
822615	ConBraCo 50-403-02 1" x 1"	6	---	6	6	---			
822616	ConBraCo 50-503-02 1 1/4" x 1 1/4"	---	6	---	6	6			
822645	Pilot Shutoff Valve								
822619	Newman-Milliken 200M - 1"	7	7	7	7	7			
822620	Newman-Milliken 200M - 1 1/4"	8	---	8	8	---			
		---	8	---	8	8			

PART NO.	6011301	100958-01
Description	Manifold Module Support Bracket Assembly	Honeywell S8610M3009 Ignition Module

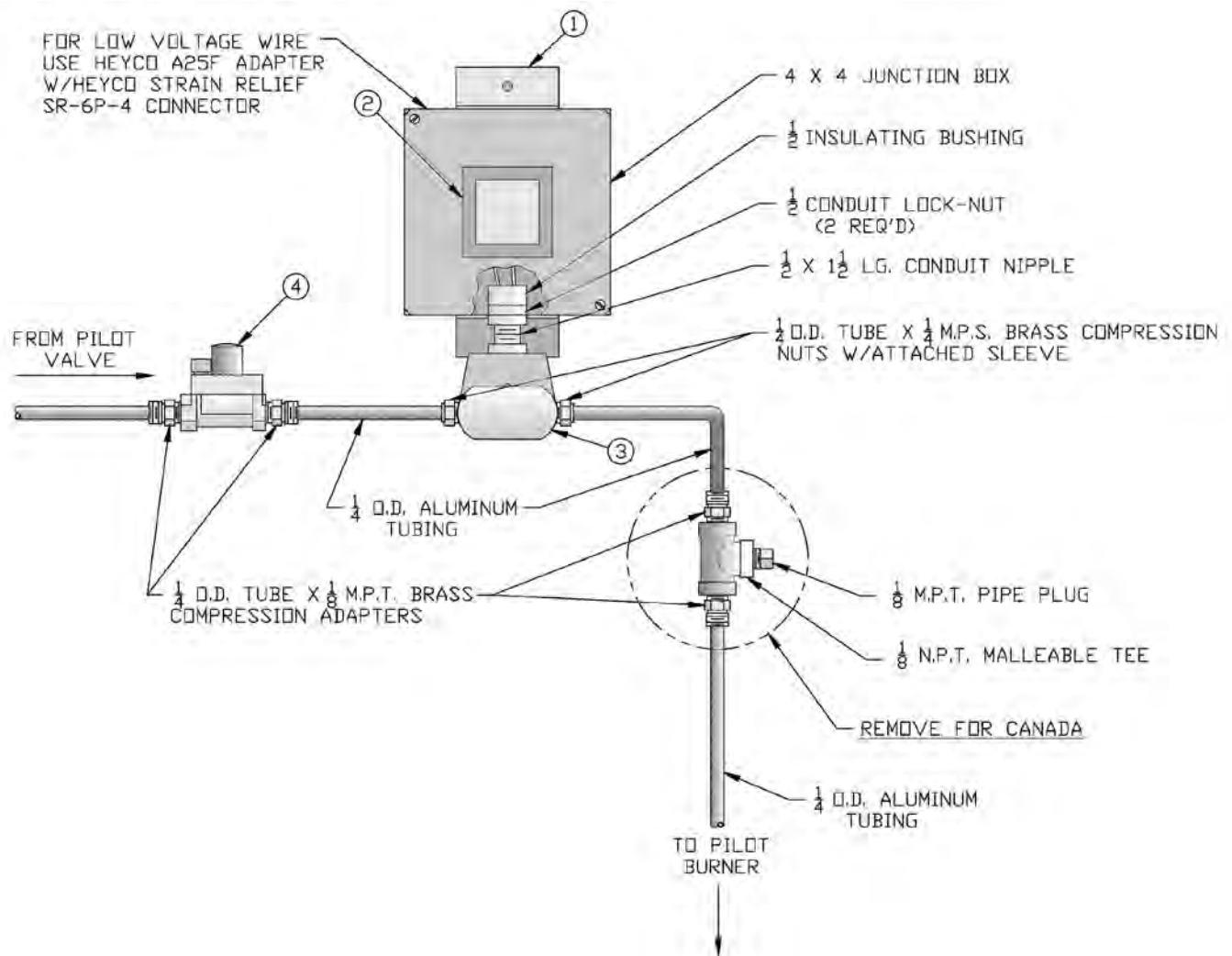


MANIFOLD MODULE SUPPORT BRACKET



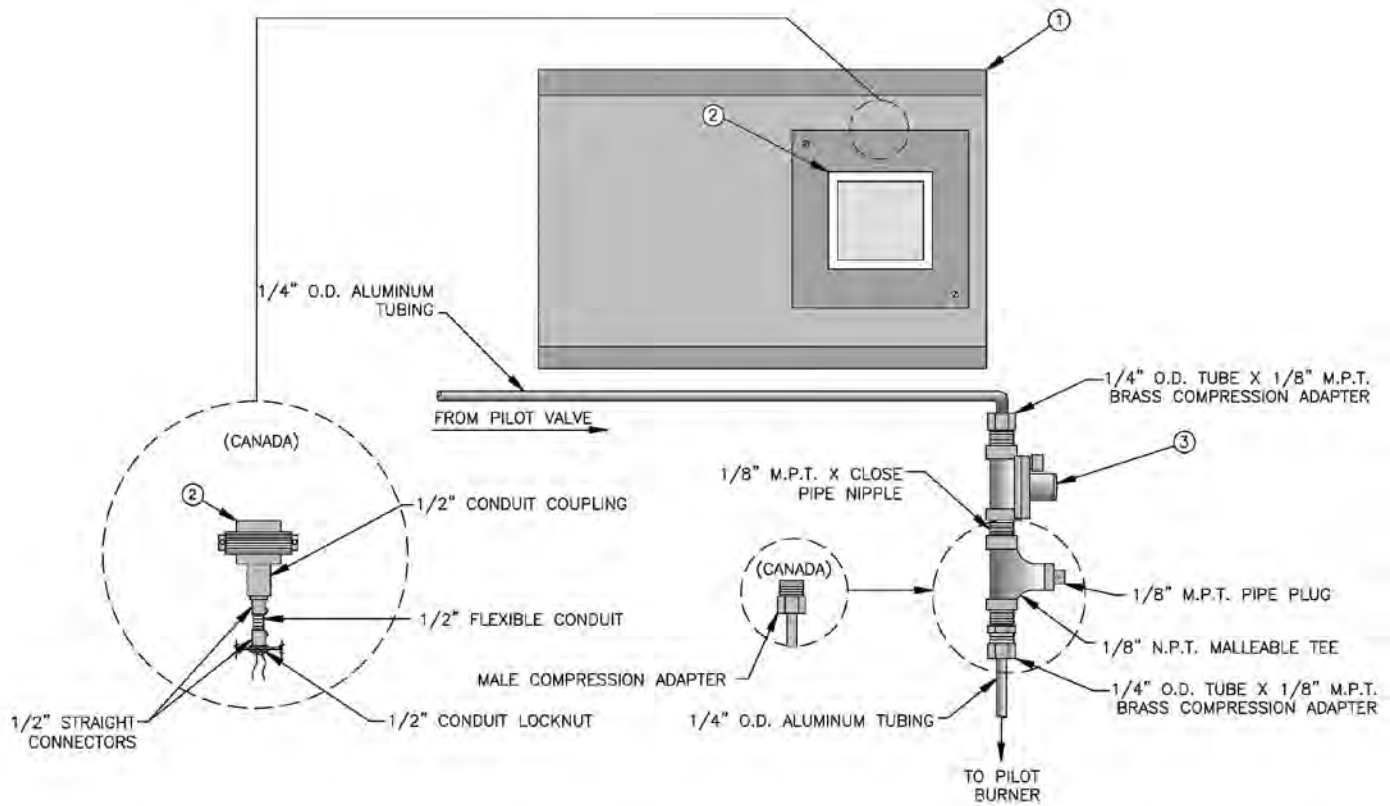
ITEM	(1)	(2)
PART NO.	6011301	80160138
Description	Manifold Module Support Bracket Assembly	L62GB-3C Pilot Safety Switch

PILOTSTAT & SUPPORT BRACKET EO - EOP - THERMOCOUPLE CONTROL SYSTEM



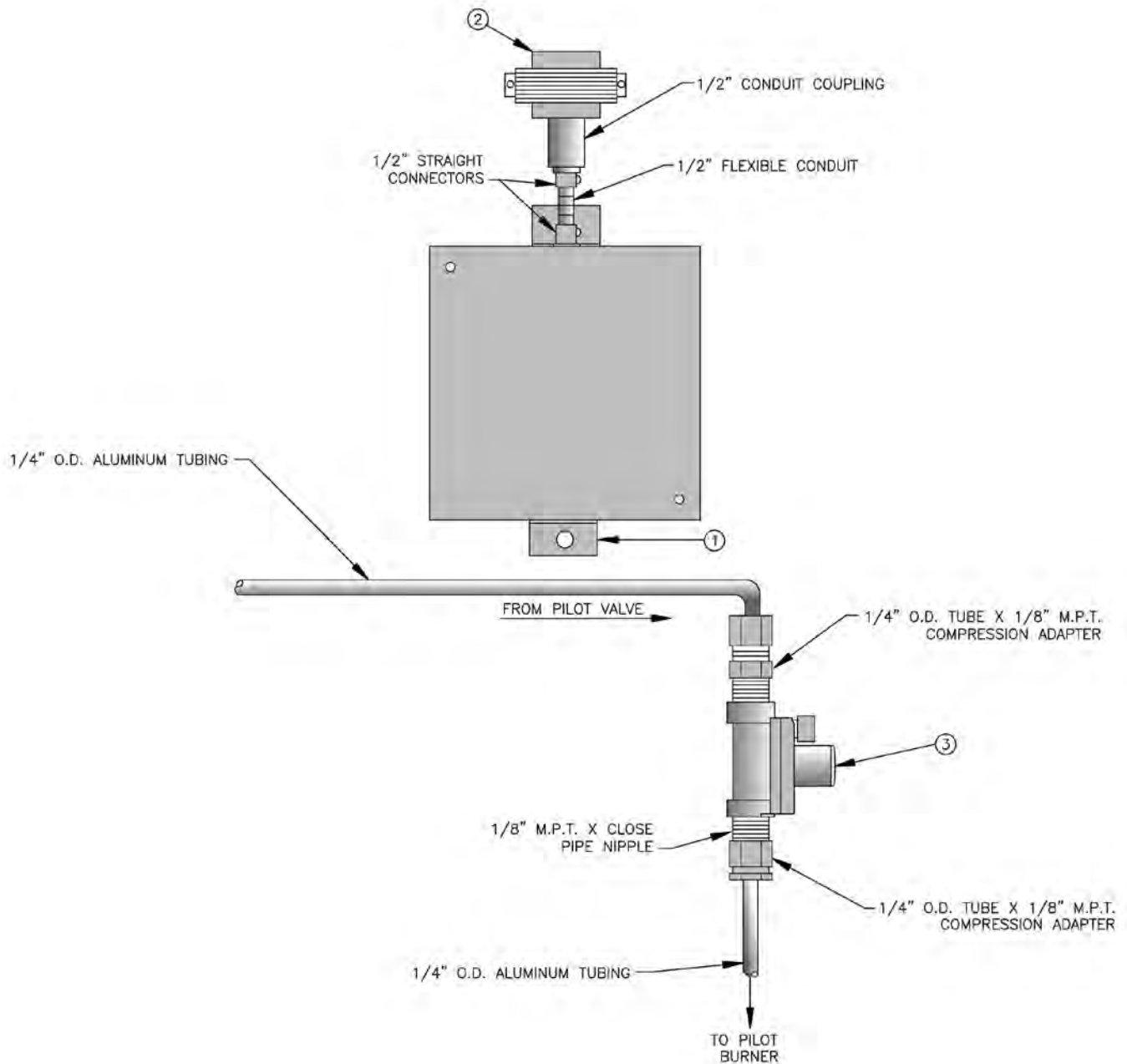
TRANSFORMER, PILOT SOLENOID VALVE & PILOT LINE REGULATOR
EI CONTROL SYSTEM
U.S.A. - 5010B-5026B NAT. GAS
CANADA - 5006B-5026B NAT. GAS

PART NO.	ITEM
7136001	(1) "J" Box Mounting Bracket 24V 100 VA Transformer - 120 60HZ Primary
80160016	(2) Penn Y64T22-0 Plate Mounted
822666	(3) Penn Pilot Solenoid Valve H91WG-6
8226005	Pilot Line Regulator Nat. Gas - Maxitrol RV-12-LT w/orange spring 4" to 8" WC
8136037	Heyco A25F Strain Relief Adaptor
8136038	Heyco Strain Relief Bushing SR-6P-4



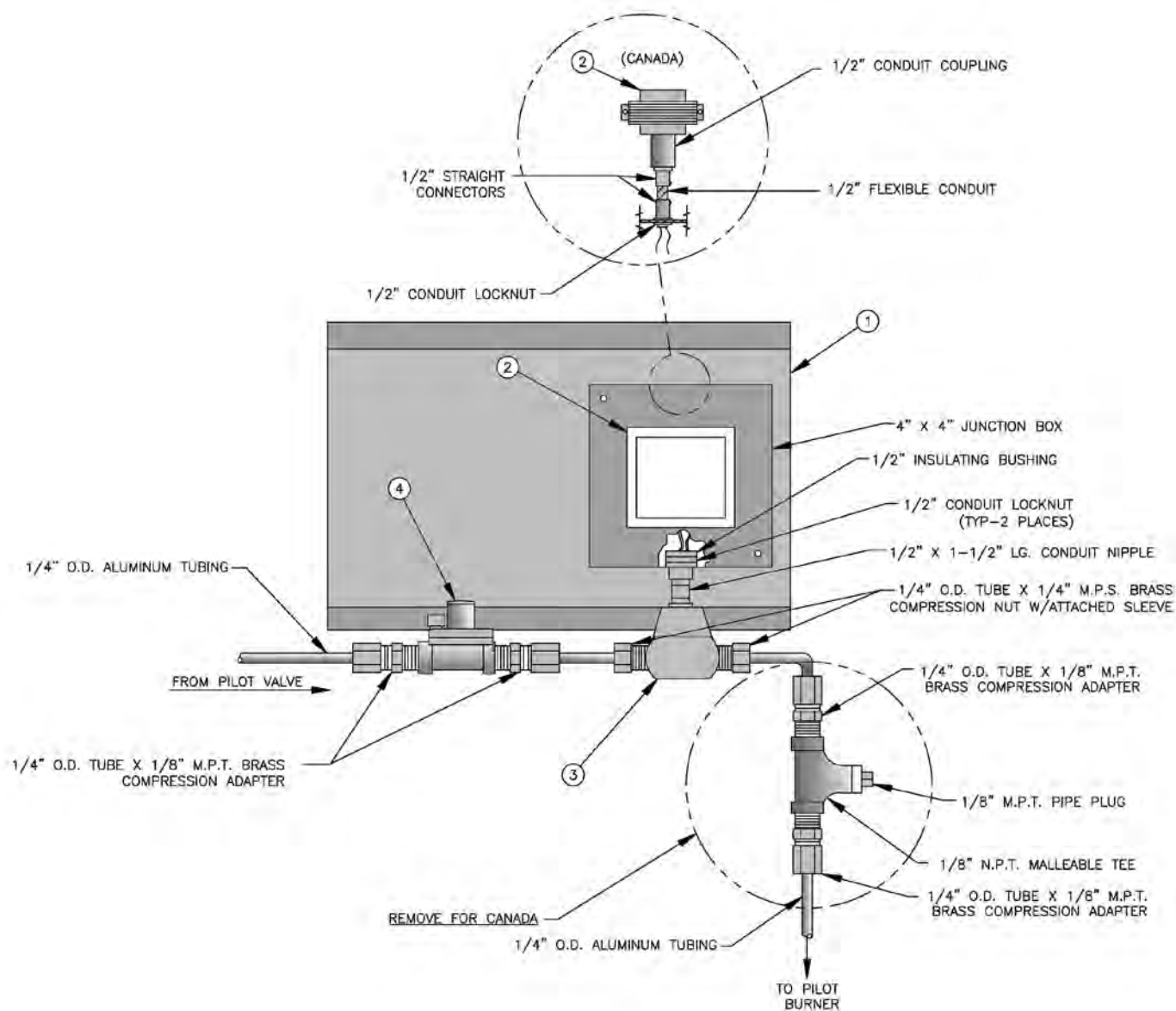
TRANSFORMER & PILOT LINE REGULATOR
EO CONTROL SYSTEM

PART NO.	ITEM
7016003	(1) EE & EO Control Mounting Bracket 24V - 40 VA Transformer - 120V 60HZ Primary
80160039	(2A) USA - Honeywell Plate Mounted AT140D1012
80160014	(2B) Canada - Honeywell Foot Mounted AT72D1089
8226005	(3) Pilot Line Regulator Nat. Gas - Maxitrol RV-12-LT w/orange spring 4" to 8" WC



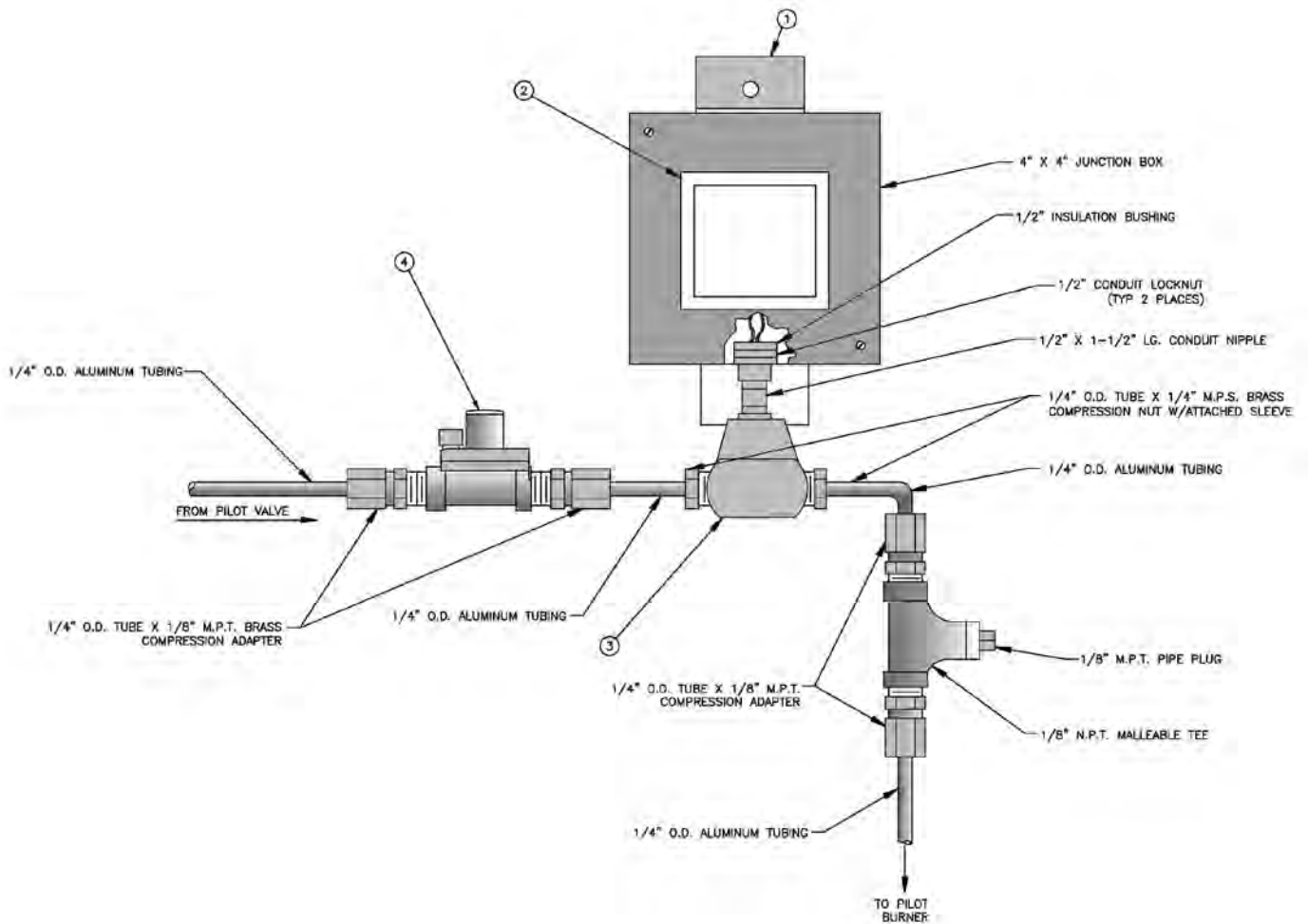
TRANSFORMER & PILOT LINE REGULATOR
EOP CONTROL SYSTEM - U.S.A.
THERMOCOUPLE CONTROL SYSTEM - CANADA

PART NO.	ITEM
7016001	(1) "J" Box Mounting Bracket 24V - 40 VA Transformer - 120 60HZ Primary
80160039	(2A) USA - Honeywell Plate Mounted AT140D1012
80160014	(2B) Canada - Honeywell Foot Mounted AT72D1089
8226005	(3) Pilot Line Regulator Nat. Gas - Maxitrol RV-12-LT w/orange spring 4" to 8" WC



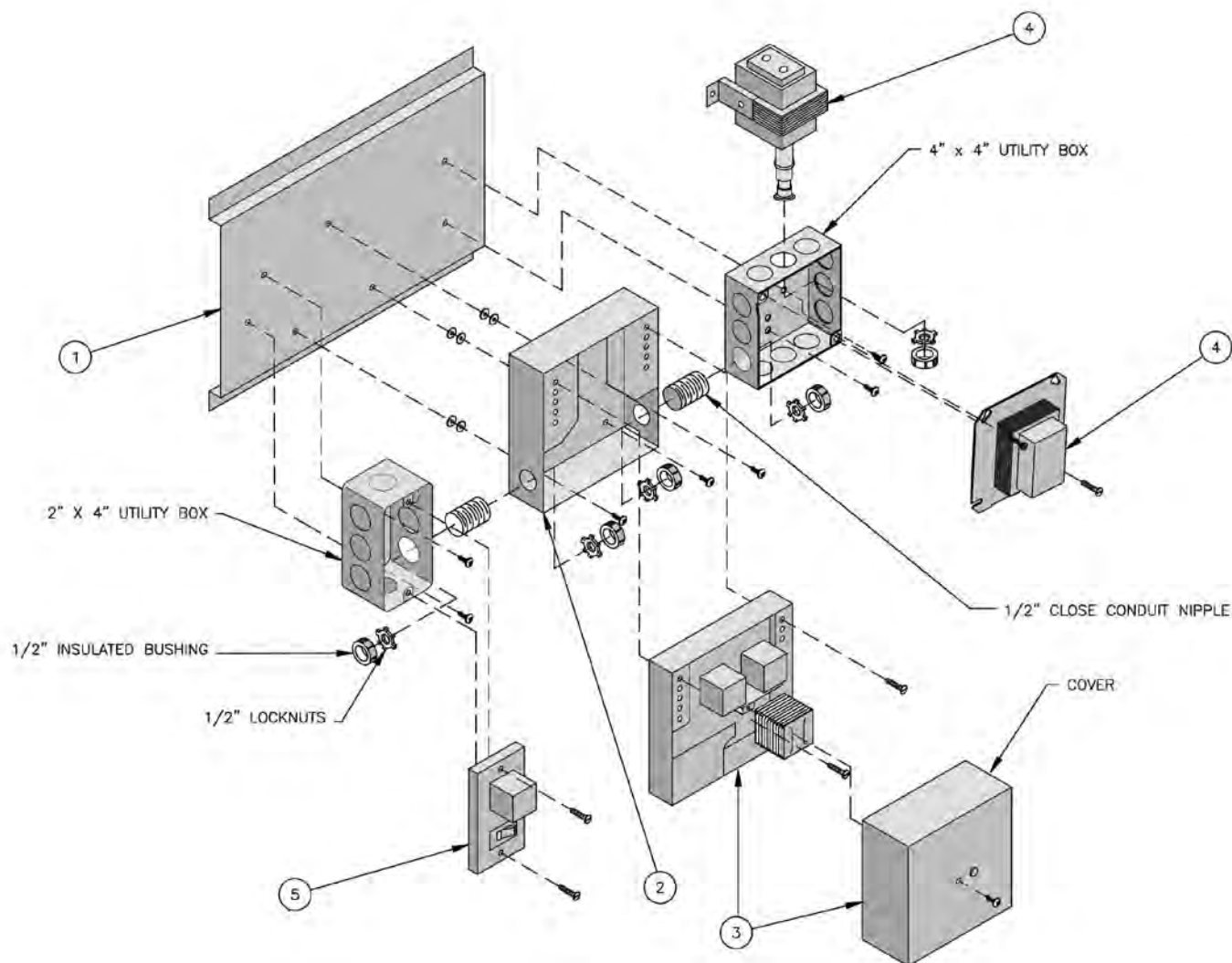
TRANSFORMER, PILOT SOLENOID VALVE & PILOT LINE REGULATOR
EE CONTROL SYSTEM

PART NO.	ITEM
7016003	(1) EE & EO Control Mounting Bracket 24V - 40 VA Transformer - 120V 60HZ Primary
80160039	(2A) USA - Honeywell Plate Mounted AT140D1012
80160014	(2B) Canada - Honeywell Foot Mounted AT72D1089
822662	(3) Penn Pilot Solenoid Valve H91WA-4, 120V
8226005	(4) Nat. Gas - Maxitrol RV-12-LT w/orange spring 4" to 8" WC
80160018	Webster 612-6A7 Ignition Transformer (not shown)



TRANSFORMER, PILOT SOLENOID VALVE & PILOT LINE REGULATOR EEP CONTROL SYSTEM

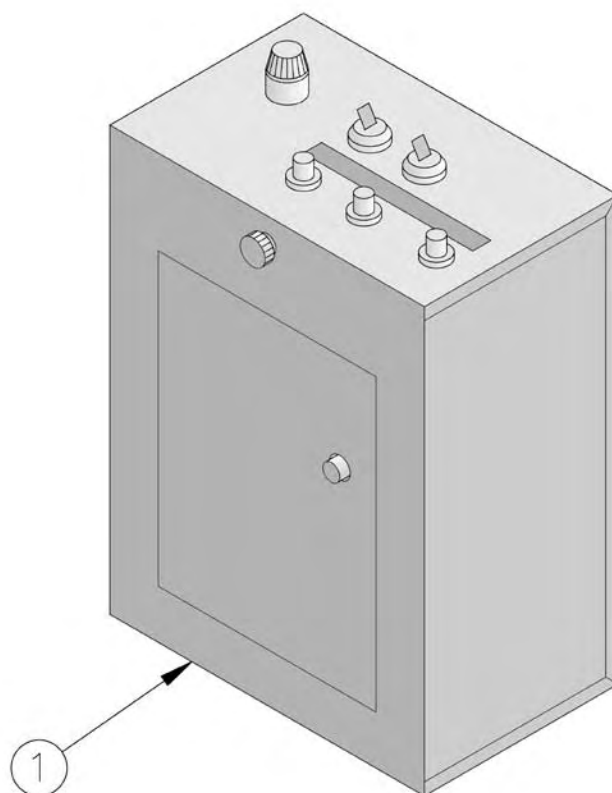
PART NO.	ITEM
7136001	(1) "J" Box Mounting Bracket 24V -40 VA Transformer - 120 60HZ Primary
80160039	(2) USA - Honeywell Plate Mounted AT140D1012
822662	(3) Penn Pilot Solenoid Valve H91WA-4, 120V
8226005	Pilot Line Regulator
80160018	(4) Nat. Gas - Maxitrol RV-12-LT w/orange spring 4" to 8" WC
	Webster 612-6A7 Ignition Transformer (not shown)



CONTROL ASSEMBLY & MOUNTING BRACKET
EO - EE CONTROL SYSTEMS

TRANSFORMER, PILOT SOLENOID VALVE & PILOT LINE REGULATOR
EE CONTROL SYSTEM

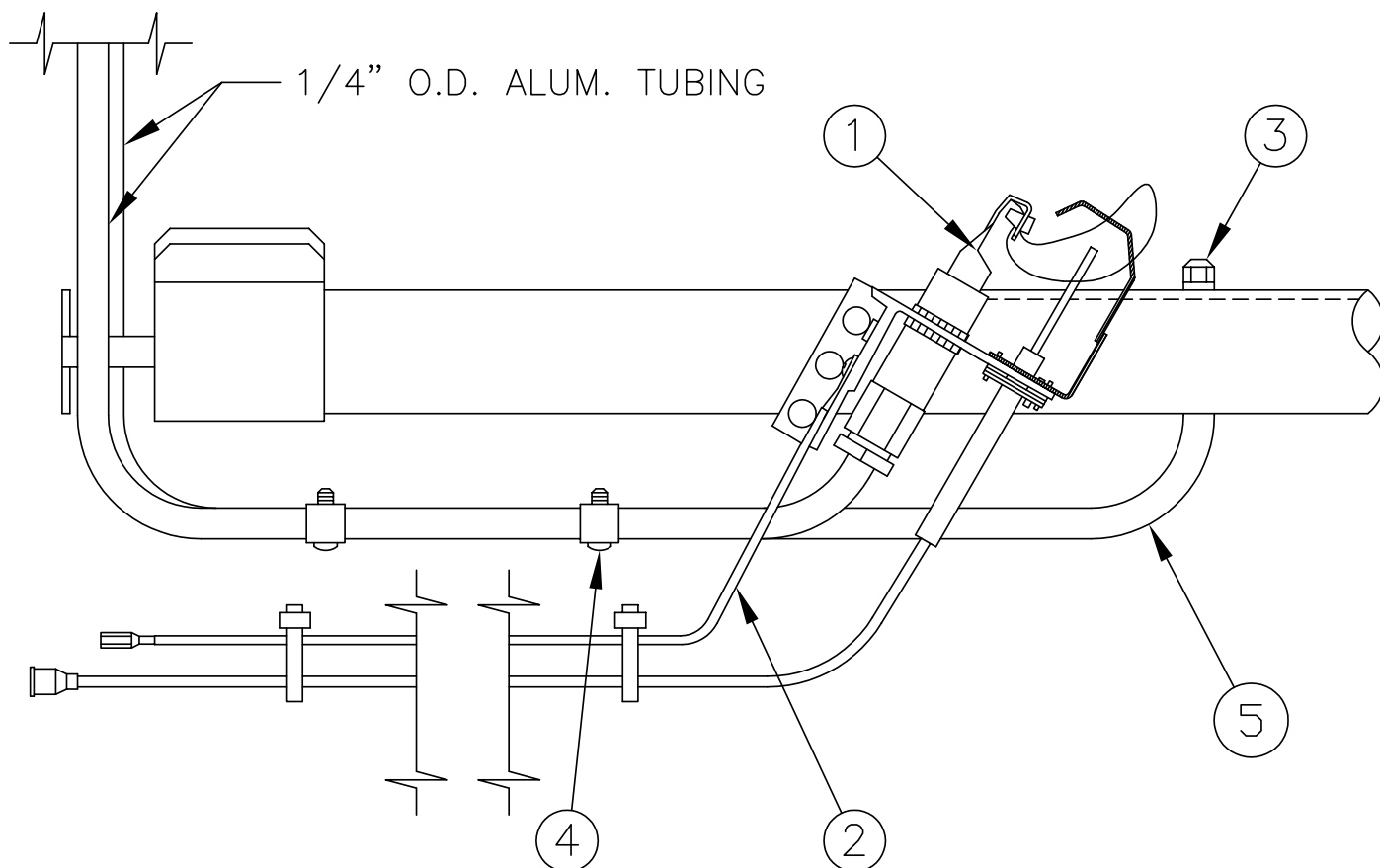
PART NO.	ITEM
7016003	(1) EE & EO Control Mounting Bracket
8136016	(2) Honeywell Q270A1024 Sub-Base for RA890F Protectorelay
80160008	(3) Honeywell RA890F1270 Protectorelay 24V - 40 VA Transformer - 120V 60HZ Primary
80160039	(4A) USA - Honeywell Plate Mounted AT140D1012
80160014	(4B) Canada - Honeywell Foot Mounted AT72D1089
8136017	(5) Fusetron F2H Combination Switch and Fuseholder Cover
8136031	5 AMP Plug Fuse



EOP & EEP CONTROL PANEL

EOP & EEP CONTROL PANEL

PART NO.	ITEM
6016005	(1) EOP CONTROL PANEL with the following installed: (1) Honeywell RA890F1270 Protectorelay (1) Form #51098 Operating Instruction Label
6016006	(1) EEP CONTROL PANEL with the following installed: (1) Honeywell RA890F1270 Protectorelay (1) Form #51097 Operating Instruction Label

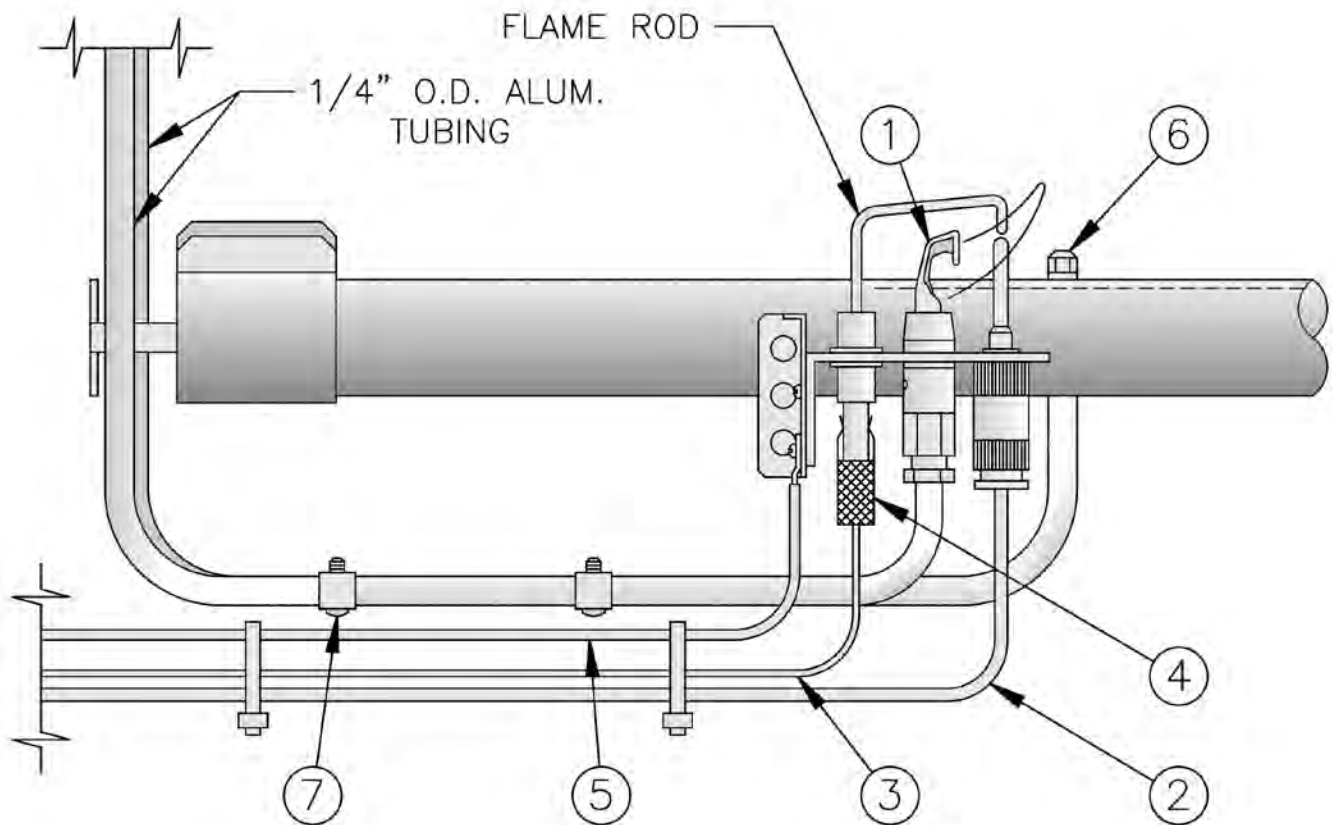


EI CONTROL SYSTEM - HONEYWELL Q3481 PILOT ASSEMBLY

EI CONTROL SYSTEM - PILOT ASSEMBLY

100331-01 EI - 1, NAT., 5006B - 6009B Sections
 100332-01 EI - 2, NAT., 5010B - 5026B Sections
 100331-01 EI - 2, NAT., 5010B - 5026B Sections
 Not AvailableLP, 5010B - 5026B Sections

PART NO.	ITEM
100331-01	(1) Pilot Burner/Igniter/Sensor Honeywell Q3481B1172, Nat. Gas with NE22 orifice
	(1) Pilot Burner/Igniter/Sensor Honeywell Q3481B1180, LP Gas with KR14 orifice
6136054	(2) Pilot Ground Wire Assembly, 36"
NEW	(2) Pilot Ground Wire Assembly, 72"
8236015	(3) Vent Tube Tip (USA Only) (5010B - 5026B Sections Only)
8236016	(4) Vent Tube Clip - Tinnerman C4886A4-27 (USA Only) (5010B - 5026B Sections Only)
8236048	(5) Vent Tube - 1/4" x 18" Long Aluminum Tubing
	For Canada, Omit Vent Tube, Vent Tube Tip and Vent Tube Clips. These items are not used on 5006B - 5009B Sections, Robertshaw Gas Valves - USA.

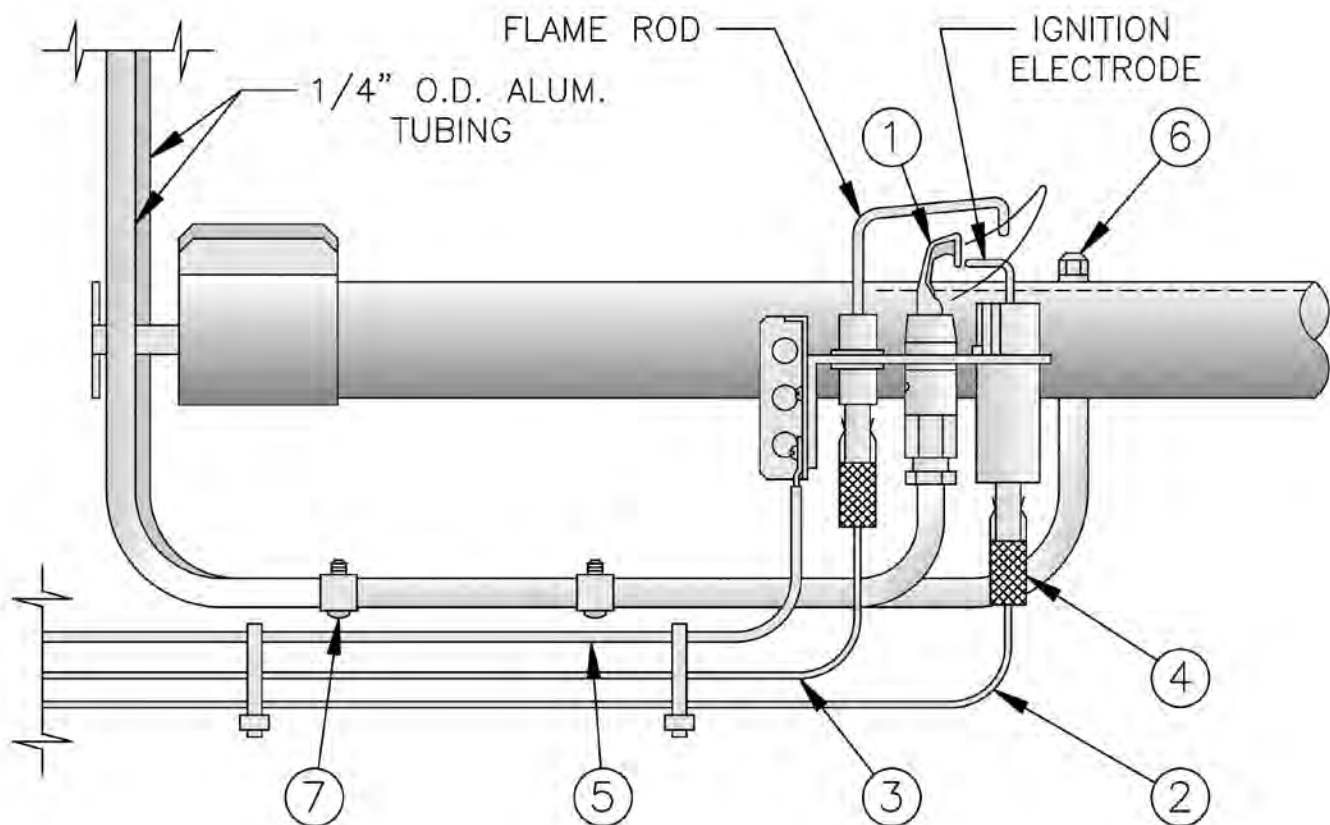


EO - EOP CONTROL SYSTEM - PILOT ASSEMBLY

EO-EOP CONTROL SYSTEM - PILOT ASSEMBLY

6236007 NAT. GAS
6236008 EI GAS

PART NO.	ITEM
	(1) Flame Rectification Pilot Ass'y
8236025	Natural Gas - Honeywell Q179D1008 w/388146 AG Orifice
8236039	LP - Honeywell Q179D1008 w/388146 KD Orifice
8236004	(2) Thermocouple - Honeywell Q309A1996 - 36" Long
7136256	(3) Flame Rod Lead - Honeywell R1298020 - 6' Long
8236021	(4) Female Rajah Connector - Honeywell 37356
6236020	(5) Ground Wire - Continental SRGX-600 200°C - Green - 72" Long
8236015	(6) Vent Tube Tip - (USA Only)
8236016	(7) Vent Tube Clip - Tinnerman C4886A4-27 (USA Only)



EE - EEP CONTROL SYSTEM - PILOT ASSEMBLY

EE-EEP CONTROL SYSTEM - PILOT ASSEMBLY

6236003 NAT. GAS
Not Available for LP

PART NO.	ITEM
8236017	(1) Flame Rectification Pilot Ass'y Natural Gas - Honeywell Q179C1009 w/388146 AG Orifice
7136255	(2) Ignition Lead - Honeywell R1061012 - 6' Long
7136256	(3) Flame Rod Lead - Honeywell R1298020 - 6' Long
8236021	(4) Female Rajah Connector - Honeywell 37356
6236020	(5) Ground Wire - Continental SRGX-600 200°C - Green - 72" Long
8236015	(6) Vent Tube Tip - (USA Only)
8236016	(7) Vent Tube Clip - Tinnerman C4886A4-27 (USA Only)

SERVICE PERFORMED[illegible]

Limited Warranty

For Commercial Grade Boilers

Using Cast Iron, Carbon Steel,
or Stainless Steel Heat Exchangers
and Parts/Accessories

Subject to the terms and conditions set forth below, Burnham Commercial, Lancaster, Pennsylvania hereby extends the following limited warranties to the original owner of a commercial grade water or steam boiler or Burnham Commercial supplied parts and/or accessories manufactured and shipped on or after October 1, 2009:

ONE YEAR LIMITED WARRANTY ON COMMERCIAL GRADE BOILERS AND PARTS / ACCESSORIES SUPPLIED BY BURNHAM COMMERCIAL.

Burnham Commercial warrants to the original owner that its commercial grade water and steam boilers and parts/accessories comply at the time of manufacture with recognized hydronic industry standards and requirements then in effect and will be free of defects in material and workmanship under normal usage for a period of one year from the date of original installation. If any part of a commercial grade boiler or any part or accessory provided by Burnham Commercial is found to be defective in material or workmanship during this one year period, Burnham Commercial will, at its option, repair or replace the defective part (not including labor).

HEAT EXCHANGER WARRANTIES

Burnham Commercial warrants to the original owner that the heat exchanger of its commercial grade boilers will remain free from defects in material and workmanship under normal usage for the time period specified in the chart below to the original owner at the original place of installation. If a claim is made under this warranty during the "No Charge" period from the date of original installation, Burnham Commercial will, at its option, repair or replace the heat exchanger (not including labor). If a claim is made under this warranty after the expiration of the "No Charge" period from the date of original installation, Burnham Commercial will, at its option and upon payment of the pro-rated service charge set forth below, repair or replace the heat exchanger. The service charge applicable to a heat exchanger warranty claim is based upon the number of years the heat exchanger has been in service and will be determined as a percentage of the retail price of the heat exchanger model involved at the time the warranty claim is made as follows:

Years in Service	Service Charge as a % of Retail Price									
	1	2	3	4	5	6	7	8	9	10+
Cast Iron	No Charge									100
Carbon Steel	No Charge	100								
Stainless Steel	No Charge					20	40	60	80	100

NOTE: If the heat exchanger involved is no longer available due to product obsolescence or redesign, the value used to establish the retail price will be the published price as set forth in Burnham Commercial Repair Parts Pricing where the heat exchanger last appeared or the current retail price of the then nearest equivalent heat exchanger, whichever is greater.

ADDITIONAL TERMS AND CONDITIONS

1. **Applicability:** The limited warranties set forth above are extended only to the original owner at the original place of installation within the United States and Canada. These warranties are applicable only to boilers, parts, or accessories designated as commercial grade by Burnham Commercial and installed and used exclusively for purposes of commercial space heating or domestic hot water generation through a heat exchanger (or a combination for such purposes) and do not apply to residential grade products or industrial uses.
2. **Components Manufactured by Others:** Upon expiration of the one year limited warranty on commercial grade boilers, all boiler components other than heat exchangers manufactured by others but furnished by Burnham Commercial (such as oil burner, circulator and controls) will be subject only to the manufacturer's warranty, if any.
3. **Proper Installation:** The warranties extended by Burnham Commercial are conditioned upon the installation of the commercial grade boiler, parts, and accessories in strict compliance with Burnham Commercial installation instructions. Burnham Commercial specifically disclaims liability of any kind caused by or relating to improper installation.
4. **Proper Use and Maintenance:** The warranties extended by Burnham Commercial are conditioned upon the use of the commercial grade boiler, parts, and accessories for its intended purposes and its maintenance accordance with Burnham Commercial recommendations and hydronics industry standards. For proper installation, use, and maintenance, see all applicable sections of the Installation and Operating, and Service Instructions Manual furnished with the unit.
5. This warranty does not cover the following:
 - a. Expenses for removal or reinstallation. The owner will be responsible for the cost of removing and reinstalling the alleged defective part or its replacement and all labor and material connected therewith, and transportation to and from Burnham Commercial.
 - b. Components that are part of the heating system but were not furnished by Burnham Commercial as part of the commercial boiler.
 - c. Improper burner adjustment, control settings, care or maintenance.
 - d. This warranty cannot be considered as a guarantee of workmanship of an installer connected with the installation of the Burnham Commercial boiler, or as imposing on Burnham Commercial liability of any nature for unsatisfactory performance as a result of faulty workmanship in the installation, which liability is expressly disclaimed.

- e. Boilers, parts, or accessories installed outside the 48 contiguous United States, the State of Alaska and Canada.
 - f. Damage to the boiler and/or property due to installation or operation of the boiler that is not in accordance with the boiler installation and operating instruction manual.
 - g. Any damage or failure of the boiler resulting from hard water, scale buildup or corrosion the heat exchanger.
 - h. Any damage caused by improper fuels, fuel additives or contaminated combustion air that may cause fireside corrosion and/or clogging of the burner or heat exchanger.
 - i. Any damage resulting from combustion air contaminated with particulate which cause clogging of the burner or combustion chamber including but not limited to sheetrock or plasterboard particles, dirt, and dust particulate.
 - j. Any damage, defects or malfunctions resulting from improper operation, maintenance, misuse, abuse, accident, negligence including but not limited to operation with insufficient water flow, improper water level, improper water chemistry, or damage from freezing.
 - k. Any damage caused by water side clogging due to dirty systems or corrosion products from the system.
 - l. Any damage resulting from natural disaster.
 - m. Damage or malfunction due to the lack of required maintenance outlined in the Installation and Operating Manuals furnished with the unit.
6. **Exclusive Remedy:** Burnham Commercial obligation for any breach of these warranties is limited to the repair or replacement of its parts (not including labor) in accordance with the terms and conditions of these warranties.
 7. **Limitation of Damages:** Under no circumstances shall Burnham Commercial be liable for incidental, indirect, special or consequential damages of any kind whatsoever under these warranties, including, but not limited to, injury or damage to persons or property and damages for loss of use, inconvenience or loss of time. Burnham Commercial liability under these warranties shall under no circumstances exceed the purchase price paid by the owner for the commercial grade boiler involved. Some states do not allow the exclusion or limitation of incidental or consequential damages, so the above limitation or exclusion may not apply to you.
 8. **Limitation of Warranties:** These warranties set forth the entire obligation of Burnham Commercial with respect to any defect in a commercial grade boiler, parts, or accessories and Burnham Commercial shall have no express obligations, responsibilities or liabilities of any kind whatsoever other than those set forth herein. These warranties are given in lieu of all other express warranties.

ALL APPLICABLE IMPLIED WARRANTIES, IF ANY, INCLUDING ANY WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE ARE EXPRESSLY LIMITED IN DURATION TO A PERIOD OF ONE YEAR EXCEPT THAT IMPLIED WARRANTIES, IF ANY, APPLICABLE TO THE HEAT EXCHANGER IN A COMMERCIAL GRADE BOILER SHALL EXTEND TO THE ORIGINAL OWNER FOR THE TIME SPECIFIED IN THE HEAT EXCHANGER SECTION SHOWN ABOVE AT THE ORIGINAL PLACE OF INSTALLATION. SOME STATES DO NOT ALLOW LIMITATION ON HOW LONG AN IMPLIED WARRANTY LASTS, SO THE ABOVE LIMITATION MAY NOT APPLY TO YOU.

PROCEDURE FOR OBTAINING WARRANTY SERVICE

In order to assure prompt warranty service, the owner is requested to complete and mail the Warranty Card provided with the product or register product online at www.burnhamcommercialcastiron.com within ten days after the installation of the boiler, although failure to comply with this request will not void the owner's rights under these warranties. Upon discovery of a condition believed to be related to a defect in material or workmanship covered by these warranties, the owner should notify the installer, who will in turn notify the distributor. If this action is not possible or does not produce a prompt response, the owner should write to Burnham Commercial, P.O. Box 3939, Lancaster, PA 17604, giving full particulars in support of the claim. The owner is required to make available for inspection by Burnham Commercial or its representative the parts claimed to be defective and, if requested by Burnham Commercial to ship these parts prepaid to Burnham Commercial at the above address for inspection or repair. In addition, the owner agrees to make all reasonable efforts to settle any disagreement arising in connection with a claim before resorting to legal remedies in the courts.

THIS WARRANTY GIVES YOU SPECIFIC LEGAL RIGHTS AND YOU MAY ALSO HAVE OTHER RIGHTS WHICH VARY FROM STATE TO STATE.



Burnham Commercial, P.O. Box 3939, Lancaster, PA 17604

Revised November 1, 2009